



# RAILROAD RESEARCH BULLETIN



**Spring 1977**  
**Volume 4 Number 1**

RRIS accessions between  
August 1976 and January 1977

**U.S. DEPARTMENT OF TRANSPORTATION**  
**Federal Railroad Administration**

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16. Abstract  <p>This publication contains 1,474 abstracts of journal articles and research reports and descriptions of computer programs and magnetic data tapes. It also has 515 summaries of ongoing research activities in the railroad field. The material, selected from current railroad literature and other contemporary sources, covers the entire range of railroading from technology to operations, management, economics and government involvement. Literature sources are worldwide. The material is arranged according to the RRIS classification scheme in two separate sections, one for the abstracts and descriptions and the other for ongoing project summaries. This publication supplements material in the eight prior Railroad Research Bulletins which should be retained for a complete file of RRIS data.</p> <p>This publication is available on a regular subscription basis from Railroad Research Information Service, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. Batch-mode computerized file searches are available directly from RRIS.</p>					
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# **RAILROAD RESEARCH BULLETIN**

**Spring 1977**  
**Volume 4 Number 1**  
**Publication 7701**

This Bulletin, containing 1474 abstracts of journal articles, research reports, computer programs, and magnetic tape data sets and 515 summaries of ongoing research activities in the railroad field, covers material accessioned by the Railroad Research Information Service between February 1976 and July 1976. Publication and RRIS operation within the Transportation Research Board are made possible by financial support provided by the Federal Railroad Administration of the U.S. Department of Transportation.

Each Bulletin contains new information and is not cumulative. Previous editions should be retained to ensure that the user has a complete record of the RRIS accessions.

**RAILROAD RESEARCH INFORMATION SERVICE**  
**TRANSPORTATION RESEARCH BOARD**  
**Commission on Sociotechnical Systems • National Research Council**  
**National Academy of Sciences**

# Railroad Research Information Service

The Railroad Research Information Service (RRIS) was developed within the National Research Council under contract to the Federal Railroad Administration of the U.S. Department of Transportation.

The RRIS computerized data system incorporates information on the planning, building, managing, operation, and regulation of rail transportation systems. A primary objective is to acquire and select information that will be timely and useful.

The scope of RRIS includes rail rapid transit. All items in the RRIS file are classified according to the basic system, and there is no separate classification for transit material. Items pertaining to rail transit can be identified under the term "Rapid Transit" in the Subject Term Index, where the document record numbers for such items are given.

Three types of data are stored in the RRIS system—abstracts of articles and reports that are within the RRIS scope, descriptions of computer programs and data sets, and summaries of ongoing and recently completed research projects.

Information concerning previous RRIS publications may be found in the RRIS Cumulative Subject Index 1973-1975,

which is available from the Railroad Research Information Service along with certain editions of the Bulletin. Some RRIS publications are available from the National Technical Information Service at somewhat higher prices. In addition to acquisition and selection, RRIS work includes the classification, indexing, storage, retrieval, and dissemination of abstracts and summaries. Concepts and procedures are similar to those of the other transportation research information services within the National Research Council—the Highway Research Information Service (HRIS) and the Maritime Research Information Service (MRIS).

The Railroad Research Bulletin, published semiannually, contains material added to the RRIS file during the preceding 6 months. Previous editions should be retained. Although RRIS publications are not themselves copyrighted, many of the abstracts in them are and are used with the permission of the copyright holder. In the Railroad Research Bulletin, any abstract followed by "Acknowledgment" should be considered as possibly subject to copyright, and anyone wishing to reproduce abstracts from RRIS publications should secure permission from the holder of the copyright.

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# Using the Railroad Research Bulletin

This volume is divided into 3 major sections: abstracts of documents; summaries of ongoing research; and indexes by subject, author, and source.

If you are interested in reviewing reports of completed research and other published documents, turn to the section, Abstracts of Reports and Journal Articles. The material in this section is arranged by RRIS subject areas. The subject area and the subject area number are listed in the Table of Contents and appear at the top of each page.

If you are interested in ongoing research projects, turn to the section, Ongoing Research Summaries. These summaries are also arranged by subject areas, which with the subject area number appear at the top of each page. An A after the subject area number identifies ongoing research project summaries.

If you can identify your interest by subject, turn to the Subject Term Index. Each term in this index is followed by the document record number, which consists of the 2-digit subject area number and the 6-digit TRIS accession number that identifies the individual document under that subject area. An A after subject area numbers indicates that the

item is a summary of ongoing research. The items are arranged in order of ascending accession numbers within each subject area.

If you are looking for abstracts of articles or reports written by a particular author or summaries of projects being conducted by a particular investigator, turn to the Author and Investigator Index and look for the individual's last name in the alphabetized listing. Again the document record number is used to find the item in the abstract or summary section.

If you are interested in abstracts of articles or reports that appeared in a particular publication or were the work of a specific publisher or if you are interested in summaries of research projects being conducted by a specific organization, turn to the Source Index. Again, use the document record number to find the item in the abstract or summary section.

Although the Subject Term Index gives a general idea of the scope of the RRIS classification system, information is available on many other terms that do not appear in this edition.

## Abbreviations

AAR*	Association of American Railroads	OECD*	Organization for Economic Cooperation and Development
AIAA*	American Institute of Aeronautics and Astronautics	ORE*	Office for Research and Experiments, UIC
AREA*	American Railway Engineering Association	OST*	Office of the Secretary of Transportation
ASCE*	American Society of Civil Engineers	PB	Prefix identifying an NTIS accession number
ASME*	American Society of Mechanical Engineers	Phot	Photographs
CIGGT*	Canadian Institute of Guided Ground Transport	Ref	References
CNR	Canadian National Railways HQ Library	Repr PC	Paper copy of original document
DOT*	U.S. Department of Transportation	RP	RRIS Repository (DOTL)
DOTL	U.S. Department of Transportation Library, Washington, D.C.	RPI*	Railway Progress Institute
ECMT*	European Conference of Ministers of Transport	Rpt	Report
EI	Engineering Index	RTAC*	Roads and Transportation Association of Canada
ESL*	Engineering Societies Library	SAE*	Society of Automotive Engineers
Fig	Figures	Shaw	Shaw Publishing Company Ltd.
FRA*	Federal Railroad Administration	SNAME*	Society of Naval Architects and Marine Engineers
FY	Fiscal year	Tab	Tables
GPO*	U.S. Government Printing Office	TRB*	Transportation Research Board
IEEE*	Institute of Electrical and Electronics Engineers	TRRL*	Transport and Road Research Laboratory
IPC*	IPC Transport Press Ltd.	TSC	Transportation Systems Center
IRCA	International Railway Congress Association	TsNII	All-Union Order of the Red Banner of Labor Scientific Research Institute of Railroad Transport
IRF	International Road Federation	TsNIITEI*	Central Scientific Research Institute of Information and Technical and Economic Research
IRRD	International Road Research Documentation	UIC*	International Union of Railways
IT*	Transport Publishing House	UITP*	International Union of Public Transport
JC	Journal Collection (DOTL)	UMTA*	Urban Mass Transportation Administration
MPS*	USSR Ministry of Railways	XUM*	University Microfilms International
NAE*	National Academy of Engineering		
NAS*	National Academy of Sciences		
NRC*	National Research Council		
NTIS*	National Technical Information Service		

\*See page v for availability of papers and research reports.

# Availability of Research Reports and Journal Articles

An availability statement is included with most abstracts. Addresses for ordering documents are given with the abstracts or with the publisher listing in the Source Index. Copies of reports and articles listed in this publication are not available from the Railroad Research Information Service. When ordering from any source, give full information on the item wanted. When ordering from the National Technical Information Service, be sure to give the NTIS accession number as well as the title and

other information. When no availability is specified with an abstract, consult an established transportation library. A loan service for publications and a photocopy service for articles and papers are available at two TRISNET Centers as explained on page vii. Because a large number of documents are available from a few sources, space and printing costs have been reduced by abbreviating sources as follows:

## AAR

Association of American Railroads  
1920 L Street, N.W.  
Washington, D.C. 20036

## AIAA

American Institute of Aeronautics and Astronautics  
Technical Information Service  
750 Third Avenue  
New York, New York 10017

## AREA

American Railway Engineering Association  
59 East Van Buren Street  
Chicago, Illinois 60605

## ASCE

American Society of Civil Engineers  
345 East Forty-seventh Street  
New York, New York 10017

## ASME

American Society of Mechanical Engineers  
345 East Forty-seventh Street  
New York, New York 10017

## CIGGT

Canadian Institute of Guided Ground Transport  
Queen's University  
Kingston, Ontario K7L 3N6  
Canada

## DOT

U.S. Department of Transportation  
Nassif Building  
400 Seventh Street, S.W.  
Washington, D.C. 20590

## ECMT

All documents available through OECD (see below)

## ESL

Engineering Societies Library  
345 East Forty-seventh Street  
New York, New York 10017

## FRA

Federal Railroad Administration  
Transport Building  
2100 Second Street, S.W.  
Washington, D.C. 20590

## GPO

Superintendent of Documents  
U.S. Government Printing Office  
Washington, D.C. 20402

## IEEE

Institute of Electrical and Electronics Engineers  
345 East Forty-seventh Street  
New York, New York 10017

## IPC

IPC (America), Inc.  
205 East Forty-second Street  
New York, New York 10017

## IT

Transport Publishing House  
Basmannyi Tupick 6A  
Moscow B-174, USSR

## MPS

USSR Ministry of Railways  
Novo-Basmanaya, 2  
Moscow B-174, USSR

## NAE/NAS/NRC

National Academy of Sciences  
Publication Sales  
2101 Constitution Avenue, N.W.  
Washington, D.C. 20418

## NTIS

National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22161

## OECD

OECD Publications Center  
Room 1207  
1750 Pennsylvania Avenue, N.W.  
Washington, D.C. 20006

## ORE

See UIC/ORE below.

## OST

Office of the Secretary  
U.S. Department of Transportation  
400 Seventh Street, S.W.  
Washington, D.C. 20590

## RPI

Railway Progress Institute  
801 North Fairfax Street  
Alexandria, Virginia 22314

## RTAC

Roads and Transportation Association of Canada  
875 Carling Avenue  
Ottawa, Ontario K1S 5A4  
Canada

## SAE

Society of Automotive Engineers  
400 Commonwealth Drive  
Warrendale, Pennsylvania 15096

## SNAME

Society of Naval Architects and Marine Engineers  
74 Trinity Place  
New York, New York 10006

## TRB

Transportation Research Board  
Publications Office  
2101 Constitution Avenue, N.W.  
Washington, D.C. 20418

## TRRL

Transport and Road Research Laboratory  
Crowthorne, Berkshire RG11 6AU  
England

**TsNIITEI**

Central Scientific Research Institute of Information and  
Technical and Economic Research  
Raushskaia Nab 4  
Moscow 113035, USSR

**UIC**

International Union of Railways, BD  
14-16 Rue Jean-Rey  
75015 Paris  
France

**UIC/ORE**

For technical reports identified by a report number such as  
B125/RP3/E (note restrictions below):  
International Union of Railways  
Office for Research and Experiments  
Oudenoord 60  
Utrecht, Netherlands

**UITP**

International Union of Public Transport  
Avenue de l'Uruguay 19  
B-1050, Brussels  
Belgium

**UMTA**

Urban Mass Transportation Administration  
400 Seventh Street, S.W.  
Washington, D.C. 20590

**XUM**

University Microfilms International  
300 North Zeeb Road  
Ann Arbor, Michigan 48106

## Restricted Availability of UIC/ORE Documents

Certain publications of the International Union of Railways (UIC) that are cited in the holdings of the Railroad Research Information Service are subject to restrictions on use. These apply particularly to the reports of the UIC Office for Research and Experiments (ORE).

The president of ORE indicates those reports that can be made available to third parties (industrial firms, individuals, universities, and technical colleges). For each report a price per copy and a separate fee for the right-of-use are established.

Members of ORE—certain railroad administrations that are members of UIC and, in the United States, the Federal Railroad Administration of the U.S. Department of Transportation—receive the ORE reports and possess, by virtue of their membership, the right to use these reports. Possession by virtue of ORE membership or the acquisition of a right-of-use covering a specific report only authorizes the holder of the information in the report to use such data for his or her own needs. This right-of-use is nontransferable. Possession of right-of-use does not authorize the holder to communicate, even in part, the contents of such a report to third parties who have not also acquired a right-of-use. An exception may be made, with special ORE authorization, for use by contractors of those organizations that have the right-of-use. Patent rights and design rights associated with solutions developed by ORE research and

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Those wishing to acquire the information in ORE reports that are referenced in the RRIS system should contact the Director, International Union of Railways, Office for Research and Experiments, Oudenoord 60, Utrecht, Netherlands. The report should be carefully identified, and the use to which the information is to be put should be completely explained. ORE will then indicate whether the report is available to third parties and specify the charges involved. The collections of ORE reports held in the United States by the Federal Railroad Administration are not available to third parties, except when they serve as contractors to that agency or other U.S. Department of Transportation elements. In such cases, the request for use must be directed to ORE through the Technology Planning Officer, RRD-1, Federal Railroad Administration, Washington, D.C. 20590.



## Loan and Photocopy Service for Publications in This Volume

The Northwestern University Transportation Center Library and the University of California Institute of Transportation Studies Library are functioning as TRISNET Centers in the operation of a prototype document delivery system under contract to the U.S. Department of Transportation. The publications in this volume may be requested from either of these Document Delivery Centers.

The objective of the TRISNET Centers is to provide the documents identified through search of the Transportation Research Information Service (TRIS) abstracting and indexing services (RRIS and the Air, Highway, and Maritime Transportation Research Information Services).

In referring your requests for publications to either of these libraries, please cite the following:

Accession number  
Author  
Article title  
Publisher or journal title  
Date of publication

The request may be for either loan of the publication for a period of 2 weeks plus estimated mailing time (Northwestern accepts a user's request directly, but University of Cali-

ornia requires submission of an interlibrary loan request) or for photocopies of articles or conference papers. If the document is unavailable at the library, referral to the best available source will be made.

Loan services are free when publications are mailed at the book rate. If the user requires priority mailing, the library will charge for mailing costs. Photocopies of articles or individual conference papers are made at the rate of 10 cents per page plus a handling charge of 50 cents per item. In all cases, invoices are mailed with the loan or photocopy.

The TRISNET Center at either library may be contacted as follows:

Transportation Center Library  
Northwestern University  
Evanston, IL 60201  
312-492-5273  
TWX 910-231-0872

Institute of Transportation Studies Library  
University of California  
412 McLaughlin Hall  
Berkeley, CA 94720  
415-642-3604

## RRIS File Searches

The RRIS file is maintained on magnetic computer tape and is available for searches for information related to specific inquiries. The key to searching is RRIS categories and appropriate subject terms. The search is normally done by computer. Output may include abstracts of articles and reports, descriptions of computer programs, and summaries of ongoing research. The output is a computer-printed listing similar in format to listings that appear in this publication.

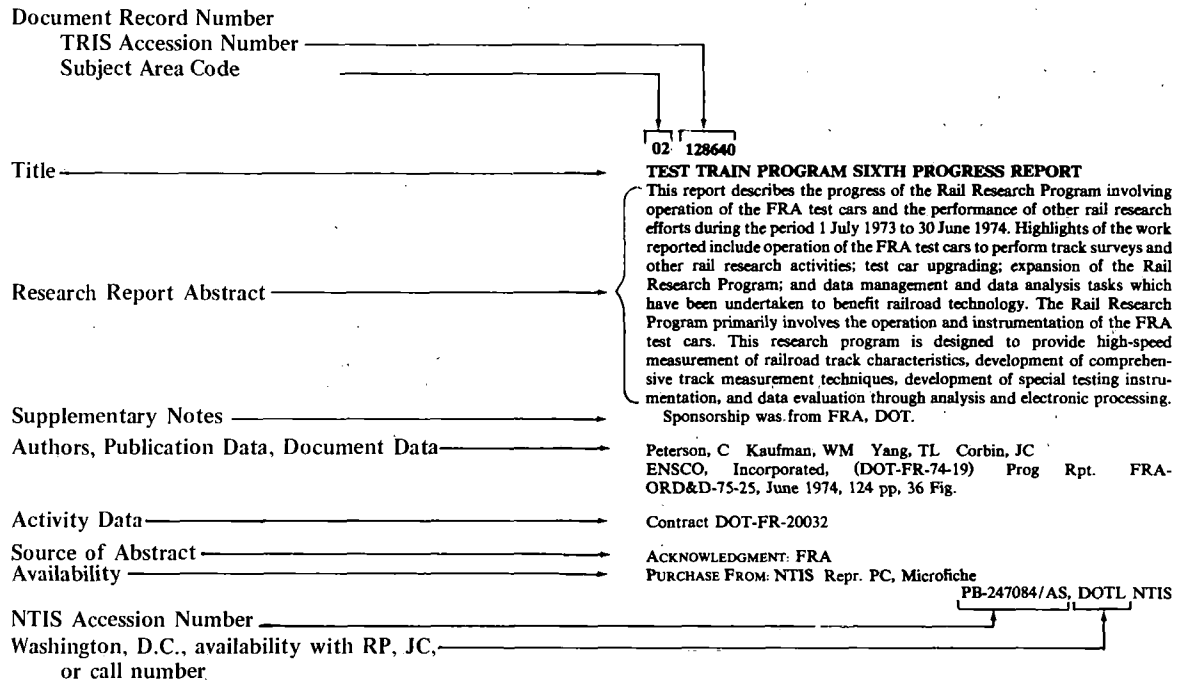
The fee schedule for RRIS file searches reflects the primary support for the service from the Federal Railroad Administration and the nonprofit nature of all National Research Council information services. The charge for computer retrieval from the RRIS file is \$50 per request plus \$0.25 per printout page, which is screened by RRIS. A written authorization or purchase order is required before the retrieval is made.

# Sample Abstracts

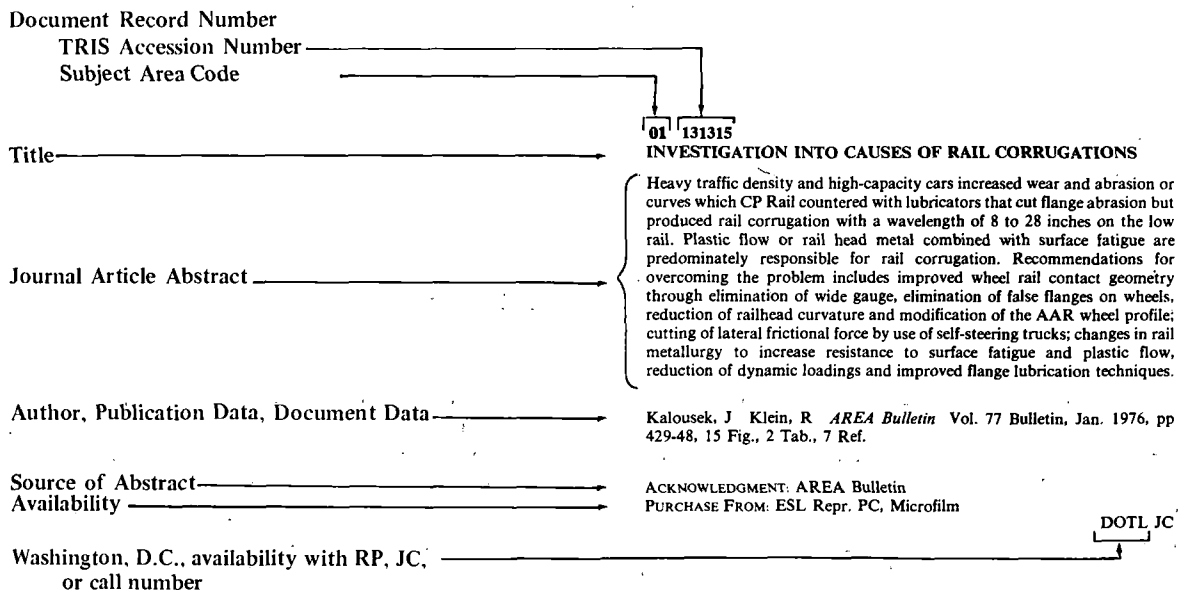
Abstracts are classified according to an 8-digit document record number: The first 2-digits indicate the RRIS subject area number and the last 6 digits indicate the TRIS accession number, which is a unique number assigned to each document. The subject area number and the subject area appear at the tops of the pages in the abstract and summary sections.

The document record number appears at the top of each abstract. Abstracts within each subject area are listed in ascending order of the accession numbers, although these usually will not be consecutive. Examples of a report abstract and of a journal article abstract appear below.

## ABSTRACT OF A RESEARCH REPORT



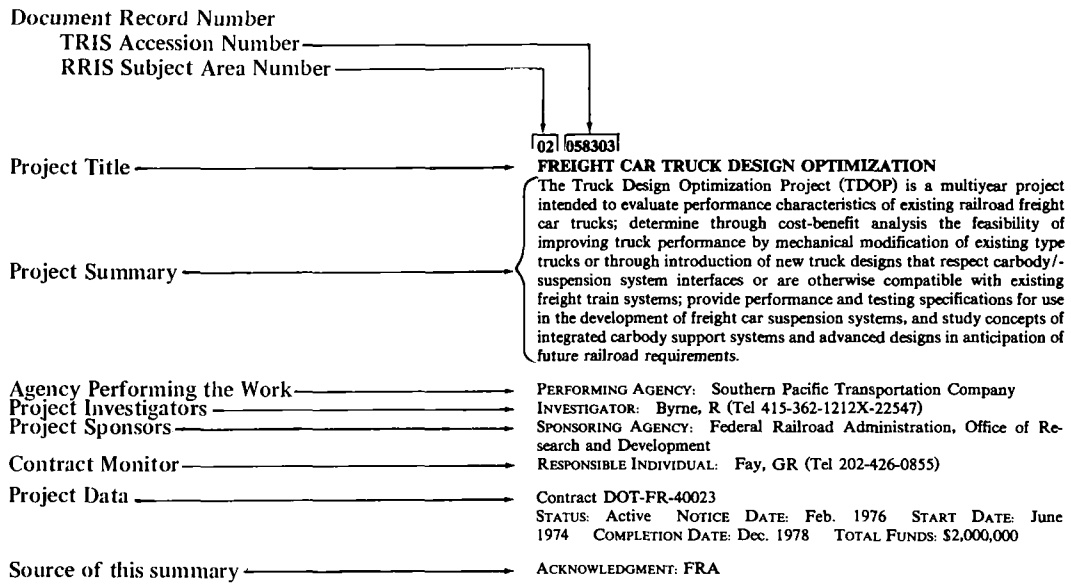
## ABSTRACT OF A JOURNAL ARTICLE



# Sample Summary of Ongoing Research

The summaries of ongoing research describe research activities currently in progress or recently completed. Each summary indicates who is performing the project, who is funding it, and how the research goal is to be attained. A summary is not a document surrogate; that is, there may not

be a full report published on the project. The summaries are in the format shown below, although each one may not contain all the elements given in this sample. The document record numbers and the order listing are the same for both summaries and abstracts.





# Abstracts of Reports and Journal Articles

00 052891

## **DISTRIBUTION OF AXLE-LOADS ON BALLASTED SLAB BRIDGES. PRELIMINARY INVESTIGATIONS AND MEASUREMENTS (V4 TESTS)**

This report covers the first of a series of 13 tests on ballasted solid double-beam slab bridge elements with a view to determining the transverse distribution of the axle-loads. It also contains the results of theoretical preliminary investigations and trials in connection with the test procedure. With a beam-and-slab bridge element 4 metres wide and 1.95 metres long measurements were taken of the ballast pressure exerted on the slab and also of the changes in the form and position of the element under loads of 100, 200 and 300 kN. The most important results are that: 1. The ballast pressure is concentrated in a zone underneath the rails. 2. The resultant of the ballast pressure under one half of the sleeper is displaced in the direction of the sleeper support as the load increases.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D115/RP 1/E, Apr. 1971, 30 pp, 16 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 052892

## **DISTRIBUTION OF AXLE-LOADS ON BALLASTED SLAB BRIDGES. MEASUREMENTS RELATING TO TESTS V1 TO V13. CONCLUSIONS AND RECOMMENDATIONS**

The present report deals with a series of 13 tests on 4 different double-beam slab bridge components on ballast to determine the transverse distribution of the axle-loads. The ballast pressures acting on the 4.0 m wide and 1.95 m long double-beam slab bridge components, as well as the shape and length alterations, were measured when subjected to a load of 100 kN, 200 kN and 300 kN. The main results are: The hillshaped distribution of the ballast pressure under the two halves of a sleeper concentrates in the region under the rail. The gravity centers of the two "hills" move towards the slab supports when the loading is increased. Two rectangular loads are suggested as equivalent load pattern with the centers of gravity corresponding to those of the recorded ballast pressure hills. Formulae and diagrams are provided and the use of these will ensure the determination of the centers of gravity along more reliable lines than was the case when relying on assumptions used hitherto.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. D115/RP 2/E, Oct. 1972, 38 pp, 19 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 052897

## **PROBLEMS OF HIGH STRENGTH BOLTED CONNECTIONS IN STEEL CONSTRUCTION. COEFFICIENTS OF FRICTION OF FAYING SURFACES SUBJECTED TO VARIOUS PRE-TREATMENTS**

The object of the present Interim Report No. 1 consists of: 1. Establishing uniform conditions for the testing procedures for the purpose of: 2.

Reducing as far as possible the scatter of the values of the coefficient of friction and the pretension; 3. In particular, establishing the effects of different methods used for the preparation of faying surfaces; and 4. Making use, for the work of the Specialist Committee D 90, of the investigations of other bodies in related fields of research. For this purpose, the faying surfaces of five specimens each in steel St 37 and steel St 52, each yielding 10 measured values, were tested with various blasting media (wire shot, corundum, quartz sand, chilled iron grit, and flame-cleaning). Specimens whose faying surfaces were treated with chilled iron grit or quartz sand yielded the highest mean values of the coefficient of friction, the lower limit of confidence of which was above 0.60 for both grades of steel. There are not sufficient grounds to justify the difference in the values of the coefficient of friction of steel St 37 and steel St 52 stipulated in Section 2.2 of the UIC Memorandum 770 R. For faying surfaces prepared immediately prior to assembly and not protected against corrosion, it is recommended that the use of chilled iron grit or of quartz sand be specified for the removal of rust and of mill scale in order to achieve the highest possible values of the coefficient of friction.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D90/RP 1/E, Oct. 1966, 27 pp, Refs., 1 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 052898

## **PROBLEMS OF HIGH STRENGTH BOLTED CONNECTIONS IN STEEL CONSTRUCTION. COEFFICIENTS OF FRICTION OF FAYING SURFACES SUBJECTED TO VARIOUS CORROSION-PROTECTIVE TREATMENTS**

In slip-proof connections of structural steel-members by means of high-strength pre-tensioned bolts, the transfer of forces by friction depends on the manner of pre-treatment of the faying surfaces. It may be expected that the use of corrosion-protective coatings on these faying surfaces, the desirability of which is known from experience, will have a considerable effect on the value of the coefficient of friction, while the manner of the first pre-treatment (before the application of the protective coating) will be less decisive in such cases. This Report No. 2 describes the tests carried out to determine this effect in the context of the objectives of question D 90, and presents the results obtained in these tests.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D90/RP 2/E, June 1967, 23 pp, 6 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 052900

## **PROBLEMS OF HIGH STRENGTH BOLTED CONNECTIONS IN STEEL CONSTRUCTION. SUSTAINED LOADING TESTS**

This report contains the results of investigations into the effect of prolonged static loading (sustained loading tests) on the coefficient of friction. Four groups of specimens were selected for the tests and their faying surfaces treated as described below (see Report D 90/No. 2, conclusions 3.7 and 3.8): (a) blast-cleaned with chilled iron grit, on surface protection; (b) sprayed

aluminum coating; (c) sprayed alkaline silicate zinc dust paint; (d) sprayed zinc coating. All specimens were tested at a temperature of plus 20 degrees C, those with protected surfaces having also been tested at a temperature of plus 60 degrees C and minus 20 degrees C. The results show that none of the three protective coatings should be rejected solely as a result of its performance in the sustained loading tests. By comparison with the static tensile tests, the sustained loading tests gave less favorable results for certain types of protective coating. The tests have shown that the following coefficients of friction are justified: 0.66 for unprotected faying surfaces which have been blast-cleaned with chilled iron grit; 0.75 for faying surfaces protected by a sprayed aluminum coating; 0.45 for faying surfaces protected by a sprayed zinc coating; and 0.60 for faying surfaces protected by a coating of alkaline silicate zinc dust paint. No significant effect of extreme temperatures was found.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D90/RP 4/E, Oct. 1969, 25 pp, 9 Fig., 6 Tab., 9 Ref.

ACKNOWLEDGMENT: UIC  
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00 052901

**PROBLEMS OF HIGH STRENGTH BOLTED CONNECTIONS IN STEEL CONSTRUCTION. FATIGUE TESTS WITH PROTECTED FAYING SURFACES**

The Report describes tests, whose object is the study of the resistance to slipping, under dynamic fatigue loading, of high strength bolted connections with protected faying surfaces. It also gives the results of similar tests made by other organizations. Fatigue tests were made with specimens having faying surfaces which had been given protective coatings of sprayed aluminum or of alkaline silicate zinc dust paint. For each of the two methods of protection, the fatigue tests were made in the pulsating tensile range of applied loading with  $R = P_{sub u} / p_{sub o} = 0.075$ ; specimens with a protective coating of sprayed aluminum were also tested in the alternating range of the applied loading with  $R = 1$ . The results of the fatigue tests showed that both in the dynamic tensile tests and in the alternating tests the specimens sustained two million load cycles without the slip exceeding 150 microns. The maximum loads for a value of  $R = 0.075$ , allowed the calculation of coefficients of friction up to: 0.75 in the case of faying surfaces with a protective coat of sprayed aluminum, 0.75 in the case of faying surfaces with a protective coat of alkaline silicate dust paint and for a value  $R = -1$  at least: 0.70. For neither of the two methods of protection did the fatigue loading have a more adverse effect on the coefficient of friction than that resulting from static loading of short or prolonged durations.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D90/RP 5/E, Oct. 1970, 47 pp, 12 Fig., 4 Tab.

ACKNOWLEDGMENT: UIC  
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00 052902

**PROBLEMS OF HIGH STRENGTH BOLTED CONNECTIONS IN STEEL CONSTRUCTION. PROTECTION OF BOLTS, NUTS AND WASHERS**

The report describes tests with high strength fasteners which were unprotected or protected by zinc or cadmium plating with and without additional passivation, in sulphur dioxide and saline atmospheres. The weathering tests of the bolt categories in the Kesternich apparatus and salt spray cabinet were made with 5 groups of assembled connections, the faying surfaces of which were unprotected or protected by metal spraying with aluminum or zinc or by coating with alkaline silicate zinc dust paint, and the external surfaces of which were left unprotected or, for comparison, had been given a coating of high build red lead paint. The degree of corrosion and the pretension losses in the bolts during the period of weathering were recorded. The results are discussed and recommendations made. The report also deals with methods of tightening and mentions the results of similar tests made by other bodies.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D90/RP 6/E, Apr. 1972, 45 pp, 42 Fig., 7 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

00 052910

**BRAKING AND ACCELERATION FORCES ON BRIDGES. MEASUREMENT AND EVALUATION METHODS**

This report describes measurement and calculation methods for determining the transmission of braking and starting forces to the rails, bearings and footings of bridges. A code of procedure including tabulation is given for uniform presentation.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D101/RP 3/E, Oct. 1970, 24 pp, 21 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

00 052911

**BRAKING AND ACCELERATION FORCES ON BRIDGES. BRAKING AND STARTING TESTS ON THREE UNBALLASTED STEEL BRIDGES OF ABOUT 15, 30 AND 60 METRE SPAN**

Results from tests of three unballasted steel bridges are given and compared. The distribution of braking and starting forces through bearings and rails is revealed and the effects of span length and arrangement of track connections.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D101/RP 4/E, Oct. 1971, 78 pp, 66 Fig., 44 Tab.

ACKNOWLEDGMENT: UIC  
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00 053101

**BENDING TESTS OF STRUCTURES CONSISTING OF TWO BEAMS WELDED AT RIGHT ANGLES. DYNAMIC TESTS**

Pursuant to the previous report concerning static tests, this report gives results of fatigue tests on the same two types of beam connections. Type A has sharp corners and type B has rounded corners. Test results are summarized and conclusions are drawn in relation to design. Appendix 1 gives notes on the manufacture of the specimens and the material from which they were made. Appendix 2 is the laboratory report, giving a description of the tests and detailed results.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D86/RP 2/E, Apr. 1969, 15 pp, 58 Fig., 2 Tab., 2 App.

ACKNOWLEDGMENT: UIC  
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00 053175

**FATIGUE PHENOMENA IN WELDED CONNECTIONS OF BRIDGES AND CRANES. TESTS OF BOX GIRDERS**

Six box beams were tested in fatigue under four point repetitive loading. In three some eccentricity was applied to investigate effects of torsion. Welds corresponded closely to good practical quality, but small defects initiated failures, confirming earlier reports on the lowered fatigue resistance of large welds. Opportunity was taken to obtain further data on effects of stress concentration due to welded attachments outside the zone of maximum bending.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D 130/RP 2/E, Oct. 1975, 35 pp, 38 Fig., 18 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

00 053180

**FATIGUE PHENOMENA IN WELDED CONNECTIONS OF BRIDGES AND CRANES. FATIGUE TESTING OF BOX BEAM SLICES**

Short slices were cut from box beams and tested in fatigue to give transverse stressing equivalent to eccentric loading of the beams. Results confirmed that no premature failure in transverse bending at the welds was likely with 80 mm offset of loading in the main tests.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D 130/RP 4/E, Apr. 1976, 14 pp, 9 Fig., 2 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

00 093736

**SUBSURFACE INVESTIGATION, 10TH STREET MALL BRIDGE, SECTION D004, NEW CARROLLTON ROUTE**

Results are summarized of seven supplementary test borings made to investigate subsoil conditions at the location of piers of the 10th Street Mall Bridge crossing the Penn Central Railroad tracks adjacent to D Street S.W. in southwest Washington, D. C. The purpose of the exploration was to ascertain the condition of soils immediately overlying the mined tunnels which could have been affected by settlements occurring during the mining operation. The report contains geological sections along the lines of the bridge piers, logs of the test borings, results of laboratory tests performed on samples obtained and a brief text describing results of the investigation.

Sponsored by Washington Metropolitan Area Transit Authority, D.C., and De Leuw, Cather and Co., Inc., Washington, D.C.

Mueser, Rutledge, Wentworth and Johnston, Washington Metropolitan Area Transit Authority, De Leuw, Cather and Company, (Rept. No. 1) MRWJ-75-140, Sept. 1975, 18 pp

ACKNOWLEDGMENT: NTIS  
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PB-246101/0ST, DOTL NTIS

00 093743

**SUBSURFACE INVESTIGATION SECTION C010B, HUNTINGTON ROUTE**

Results are presented of 74 test borings made along the line of the METRO trackage in Section C010b of Huntington Route, generally in the City of Alexandria and crossing the Valley of Cameron Run south of the city to Huntington Station in Rose Hill of the Washington Metropolitan Area Metro System. The report contains a continuous geological section along the line of the trackage, logs of the borings, results of tests performed on samples obtained in the borings and a text summarizing anticipated design and construction problems.

Prepared in cooperation with Washington Metropolitan Area Transit Authority, D.C., and De Leuw, Cather and Co., Inc., Washington, D.C.

Mueser, Rutledge, Wentworth and Johnston, Washington Metropolitan Area Transit Authority, De Leuw, Cather and Company MRWJ-75-130, Oct. 1975, 73 pp

ACKNOWLEDGMENT: NTIS  
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PB-245777/8ST, DOTL NTIS

00 130205

**INCREASE IN ROADBED STABILITY ON SLIDING SECTIONS [Povyshenie ustoychivosti zemlianogo polotna na opolznevnykh uchastkakh]**

This booklet presents the following five reports: (1) The influence of the Volga River on sliding processes on river slopes; river related reasons for systematic sliding deformations in the Volsk station region, evaluation of the influence of thawing on the sliding slopes by the reservoir, prognosis of flow speeds, evaluation of possibility of river-bed erosion in reservoir conditions;

(2) Research on the effectiveness of the operation of deep drainage curtains as sliding preventive constructions; scrutinizes the results of geometrical research carried out on the Uvekskij sliding hillside, gives an evaluation of the operational effectiveness of deep drainage curtains applied in the capacity of a means for intercepting underground water in the boundaries of a sliding section for the drying and strengthening of the sliding hillside, analyses the climatic, geological, hydro-geological conditions and operations of elements of the drainage system; (3) On the choice of stabilization means for the subgrade on sliding sections of river slopes; examines problems of evaluating stability, analyses the expediency and effectiveness of applying various counter sliding and strengthening measures for stabilizing the subgrade, and notes that the stability of sliding masses decreases with the course of time under the influence of natural processes occurring within the slide. (4) Test of application of deep-water dike-dams for protection from erosion in the Uvekskij hillside district; includes dike-dam designs with indications for means for their repair, and presents research results on the effectiveness of deep water dike-dam operation (5) Survey of underwater contour of the sea-floor and deep water structures by means of a sonic depth finder. [Russian]

Abstract only available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding Ts.N.I.I. No. 487, 1973, 133 pp, 36 Fig., 45 Tab., 64 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

00 130208

**STRESSES AND ELASTIC DEFORMATIONS IN THE ROADBED UNDER THE INFLUENCE OF TRAINS [Napriazheniia i uprugie deformatsii v zemlianom polotne pod vozdeistviem poezdov]**

This publication gives the results of experimental research into the stresses in deformed subgrade under trains. Information is gathered from actual track segments and included in the data is the soil stress distribution and elasticity in the subgrade cross section and at designated deeper points--all under the passage of trains. Also shown is subgrade function as influenced by train speed, the modulus of elasticity of the subgrade, effect of random rail irregularities, character of the cross tie/ballast interface, type of rolling stock, and axle loads. The book is intended for the scientific and technical engineering professions in railroading. Also given is an analytical expression incorporating these factors. The chapters are: (1) Measuring devices and instrumentation for determining stresses and elastic deformation of subgrade; (2) Distribution of the stresses and elastic deformation in the cross section of the subgrade under passage of trains; (3) Change in the effect of train forces as influenced by depth of subgrade; (4) The influence of changing characteristics of track structure and rolling stock on the stress and deformation of the subgrade; (5) Research into peculiarities of the effects of axle loads upon the subgrade in the presence of isolated geometric irregularities of the rails. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding Ts.N.I.I. No. 460, 1972, 128 pp, 62 Fig., 34 Tab., 80 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

00 130209

**METHODS USED TO CALCULATE THE WEIGHT BEARING CAPACITY OF THE BASIC SURFACE OF ROADBEDS [Metodika rascheta nesushchei sposobnosti osnovnoi ploshchadki eksploatiruemogo zemlianogo polotna]**

This book lays out a new statistical method for the evaluation of the durability of the fundamental surface of the operational subgrade worked out on the basis of organization of direct experiments under on-location conditions. The received calculated apparatus is in full accordance with the composed practical work on the differentiation of the capacity of elements of the upper track structure according to load-stress, and is based on the integral calculation of durability characteristics of the bottom of the subgrade and its mutability during the process of operation. The book is intended for scientific and technical engineering workers of railroad



transportation. The chapters are: (1) Statement of the problem; (2) Fundamental principles and criteria for a new methodology: choice of calculation parameters; (3) Bases of methodology for experimental research into deformations of the basic surface: climatic conditions, methodology determining dependency characteristics of test sections; (4) Train loads (pressures) acting upon the fundamental surface: rolling stock and its circulation on test sections, choice of calculation zone, change in time of interaction of the ballast with the subgrade along the length of the sleeper, normal stresses, comparative evaluation of ballast pressure on the fundamental surface along concrete steel and wooden ties; (5) Accumulation of deformations of the fundamental surface: distribution of similar deformation along the track, dependency of average accumulated deformations on the allowable tonnage, definition of equivalent stresses; (6) Methods for calculating the sizes of accumulated deformations at a given level of probability; (7) Allowable residual deformations of the fundamental surface of the subgrade from non-draining bottoms; (8) Allowable stresses on the fundamental surface of the operational subgrade from the effect of the wheels of the rolling stock; finally (9) Hypotheses explaining the physical essence of the process of accumulation of deformation of the fundamental surface of the operational subgrade. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Lysiuk, VS Pozdniakov, BI Titov, VP

All-Union Labor Red Banner Railway Research Inst Proceeding Ts.N.I.I. No. 451, 1971, 112 pp, 27 Fig., 23 Tab., 51 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

00 130248

**CONTROL OF FROST DEFORMATION OF SOIL ROADBEDS ON SIBERIAN RAILROADS [Bor'ba s merzlotnymi deformatsiyami zeblianogo polotna na zheleznykh dorogakh Sibiri]**

Success in controlling frost deformations of the roadbed and an increase in the technical level of planning result in great degree from the extensive data received from geological engineering research. The latter must lead to a great differentiation of natural conditions corresponding to the regions. Special attention should be paid to the conditions and the nature of the freezing and secretion of the soils. The regions of deep seasonal freezing must be related to complex conditions. Planning, construction, and operation of the roadbed in such regions is based upon special requirements and norms which can be with practical experience. This report discusses the following topics: distribution and character of frost deformations on the roadbed; frost phenomena in the soil and their dependence on natural factors; the experience of the struggle to control heaving formations on West Siberian railroads; asbestos ballast as a mean of fighting frost deformation, and recommendations for applying anti-heave measures. Report notes that some drainages are incapable of preventing heave formations on new lines; asbestos ballast can be a means of controlling heaving; and grooves should not be used in the capacity of self-sufficient anti-heaving measures. [Russian]

From the book "Construction and Operation of the Soil Roadbed from Silt Soil" (Sooruzhenie i ekspluatatsiya zemliyanogo polonta iz pylevatykh gruntov). Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

Brediuk, GP 1964, pp 137-154, 5 Fig., 4 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya pl 32/34, Moscow G-200, USSR

00 130249

**DETERMINATION OF THE THICKNESS OF A HEAT-INSULATING INTERLAYER [Opredelenie tolsheiny teploizoliruiushchei prosloiki]**

In the past several years good results have been obtained in lowering the depth of freezing of soils with the help of thin heat-insulating interlayers. Widely utilized in the capacity of heat-insulators for protecting the soil from freezing are sturdy foam plastics, light concrete based on foam plastics (styropore-concrete), porous clay filler processed with bitumen, compressed peat, wood crust, and other light materials. In the USSR several sections of rail and automobile roads have been constructed which are heated by foam

plastics. Depending upon the thickness of the heat-insulating interlayers of this material the soil freezing process can be substantially diminished or even fully prevented. Therefore the correct definition of the heat-insulating interlayer attains very important practical significance. Data from current observations on soil freezing heated by foam plastic and other light materials bears witness that the thickness of heat-insulating interlayers depends upon local climatic conditions that mainly influence the depth of freezing of the soils, the properties of the heat-insulator (coefficient of water-permeability and specific thermal capacity) and its distribution in road constructions. On the basis of this data a formula has been elaborated by the author for determining the thickness of heat-insulating layers which fully protect the soil from freezing but can also be used for determining the thickness of heat-insulating interlayers in railroad embankments, as well as for calculating the heating of pits and others objects. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Gaivoronskii, VN *Transportnoye Stroitel'stvo* No. 12, 1974, pp 39-40

ACKNOWLEDGMENT: FRA

ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya pl. 32/34, Moscow G-200, USSR

00 130250

**ELIMINATION OF EMBANKMENT SEDIMENTS [Ustraneniye osadok nasypei]**

In the Trans-Siberian, Trans-Baikal, and Far East roads located in permafrost regions, embankment sediments are widely distributed. Two types of sediments can be distinguished. The first type consists of soils in the embankment foundations, in the form of loams, sandy loams, and turf located at a certain depth (2.5-3.5 m.) in permafrost conditions or underlying more stable ground: sand, conglomerate rock. The second type of sediment is distributed mainly on sections with heavy masses closely deposited on the surface of ice-impregnated permafrost soils. Sediments of this type occur as well as the result of the compression of heavily moistened soils of the foundation. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Zarubin, NE *Put' i Putevoye Khozyaistvo* No. 10, 1960, pp 15-16, 3 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novoryazanskaya ul., Dom 12, Moscow 288, USSR

00 130251

**CALCULATION OF THE DEPTH OF FREEZING OF SOILS AND OF THE THICKNESS OF ANTI-HEAVING COVERINGS [K raschetu glubiny promerzaniya gruntov i tolschiny protivopushinnykh pokrytii]**

The calculation of the thickness of anti-heaving coverings and the freezing depths of soils is necessary for the elaboration of effective procedures for controlling unequal heaving of soils of railroad roadbeds. For the definition and planning of the thickness of anti-heaving coverings data from geological and engineering inspections of heaving sections of the roadbed were used. In the process of inspection the depth of the seasonal freezing and the physical heat properties of the frozen soil are determined. According to the data obtained in this manner a calculation is carried out of the thickness of the anti-heaving covering or of exchange of the heaving soil by another, non-heaving material (slag, asbestos, by-products, sandy gravel soil, etc.) The purpose of this report is to attempt to give (according to the results of full-scale observations carried out on the West-Siberian railroad from 1962 to 1967) a method of calculation of the thickness of the anti-heaving covering at a certain depth of the seasonal freezing of the soil, including its humidity, the seepage of the heat from below during the sinusoidal change of the temperature at the surface, and soils in the freezing period. The calculation should be made taking into account climatic factors and physical heat characteristics of the material of the anti-heaving covering which influence its thickness. Such climatic factors are the amplitude of the temperature oscillations on the surface and the average yearly temperature of the soil at the base of the seasonal freezing layer. The article elaborates a method for the calculation entailing over 50 equations. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

Kopytov, IA  
Institute of Railway Transportation Engineers Proceeding No. 74, No  
Date, pp 162-182, 7 Fig., 8 Ref.

ACKNOWLEDGMENT: FRA  
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USSR

00 130253

**METHOD FOR DETERMINATION OF THE HEIGHT OF EMBANKMENTS ON ICED-OVER PORTIONS OF THE CENTRAL TRANS-BAIKAL** [Metodika opredeleniia vysoty nasypei na uchastkakh naledeobrazovaniia tsentral'nogo zabaikal'ia]  
In the USSR there has been accumulated and correlated much experience in the struggle to control ice layers of varied origins. The article proposes methods for determining the height of embankments of rail and automobile roads on sections with ice formation in the Trans-Baikal region. The analysis of the layout of 370 km. of automobile roads built with various types of road surfacings and the research on ice formation in 1964-1970 established that the height of road embankments on sections in the Central Trans-Baikal is determined by the maximum strength of the ice layers. Observations revealed that the greater the volume of ice layers and the gradient of the ice-formation section, the greater the strength of the ice forming in the road. The form of the ice and its geometric dimensions are stipulated by the form of the river valley. In a wide valley the ice has the possibility of spreading over a large area and therefore its average strength is small, whereas in narrow valleys the strength of the ice is significantly greater. According to the proposed nomogram it is possible to define the height of the ice, by allowing the exclusion of the escape of ice layers onto the roadbed, and, consequently, the shortening of the road construction period and the decrease of stability due to the elimination of changes which bring the height of the ice up to the required mark during the course of operations. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration,

Nevskii, SD *Transportnoye Stroitel'stvo* No. 9, 1971, pp 39-40

ACKNOWLEDGMENT: FRA  
ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya p1. 32/34,  
Moscow G-200, USSR

00 130254

**FROZEN AND WARM BELTS AND THERMAL AMELIORATION OF ICED-OVER SECTIONS** [Merzlotnye i teplovyie poiasa i teplovaia Melioratsiia nalednykh uchastkov]

This report reaches the following conclusions: (1) The thermal process of the belt is determined mainly by the strength of the snow covering. In the absence of snow covering or in the case of its systematic recession the belt operates as a frost, accelerating the freezing of the soil and the formation of the frost crosspiece, especially in low air temperatures. In the absence of sufficient snow covering strength the belt operates as heating. (2) A cause for the defrosting of the permafrost soil under especially wide frost belts is the destruction of the natural thermofrost operation of the soil as the result of removing the peat-growing covering on the sections adjacent to the belt, and the lack of a systematic cleaning of the belt of snow. (3) Frost belts with a width of 1-2 m., and, in austere climatic condition over 0.6m., ensure reliable, quick, and sufficiently deep freezing of the soil and formation of the frost groove. Work and means expenditure for cleaning such belts of snow are brought down to the minimum. (4) Frost belts wider than 2 m. require greater outlays for maintenance. These outlays are sometimes so large that it becomes expedient to apply other means for controlling ice. (5) Taking into account devices which lead water off in the permafrost region, and the fact that this changes the thermal behavior of the soil, as well as the fact that widths of up to 2 m. ensure necessary freezing intensity of the soil beneath them, it is expedient to use raised channels as frost belts. (6) If, according to local conditions, it is possible to create a strong snow covering over a belt with the help of snow-retaining nets, it is expedient to apply heat belts. (7) During planning of the mechanisms on frozen sections it is necessary to produce, in addition to hydraulic, technical heat calculations for the definition of a thermal behavior of the soil and changes of behavior of the subterranean water. [Russian]

Abstract only is available in English, original untranslated as of November 1976. From the book "Control of Icing on Railroads and Highways" (Bor'ba s nalediam i na zheleznykh i avtomobil'nykh dorogakh).

Rumiantsev, EA  
Transport Publishing House 1966, pp 55-71, 8 Fig., 5 Tab., 27 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow  
B-174

00 130255

**CONSTRUCTION OF THE ROADBED WITH DEGRADATION OF PERMAFROST** [Sooruzhenie zemlianogo polotna s degradatsiei vechnoi merzloty]

The condition of the roadbed on one of the long-term conservation railroad sections in the Far East attests convincingly to the possibility of constructing a roadbed with permafrost degradation. This line passes through slanting terraces, going across into a contour of low, rounded, isolated hills, covered, in places, as a rule, by turfed horizontal or sloping stretches with numerous small knolls or ridges with swampy patches between, covered by dense growth, with separate thermal karst valleys and hillocks of heaving. The average yearly temperature of the air is 3.8 degrees C.; the air temperature oscillates within the limits of -53.5 degree and 33 degree. Strong solar radiation is observed. The possibility of constructing a roadbed with permafrost degradation here shows promise of year-around building in similar circumstances with normal construction techniques. The increase of the volume of earth work upon the supplementary enlargement of the embankment and the replacement from the settlement of hidden soils of the foundation does not exceed the analogous increase of the volumes of soil on the pourings off of the road shoulder, and also the required over estimation of the height of the embankment during construction with preservation of the permafrost. Manual labor is fully excluded, which is inescapable in the construction of turf heat-insulating coverings. The reliability of the roadbed in operation is guaranteed inasmuch as the possible settlements are reckoned into the constructions of the roadbed, and the reversibility of frost processes and soil freezing of the embankment below cannot cause random deformations. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration,

Solodovnikov, BI *Transportnoye Stroitel'stvo* 1969, pp 40-42, 2 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya p1. 32/34,  
Moscow G-200, USSR

00 130256

**ANTI-HEAVING CUSHIONS OF GRANULATED SLAG** [Protivopuchinye podushki iz granulirovannykh shalkov]

It is possible to construct anti-heaving (anti-deformational) cushions from nickel granulated materials in the late fall and late spring frosts. With correct design, and taking into consideration the properties of the material and high quality processing, such cushions are an effective and economical means for eliminating heaving. Nickel slag has been used in the construction of a second track on the Serozak-Isakovo railroad run over a 1 m. anti-deformational cushion. Asbestos by-products were used as ballast, and covered as well the basic area's shoulders. These granulated nickel slags have been used more and more widely over the past several years. They are a by-product formed during smelting of nickel ores and quick cooling of the liquified (igneous liquid) metal in granulated regions. The slags can be applied without auxiliary elaboration, enrichment, or fractioning. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Surin, NA *Put' i Putevoye Khozyaistvo* No. 12, 1973, pp 8-10, 5 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSR Novoryazanskaya ul., Dom 12, Moscow 288, USSR

00 130257

**A COVERING OF QUICK-HARDENING FOAM PLASTIC FOR PROTECTING SOIL FROM FROST** [Pokrytie iz bystrotverdeiushego penoplasta dlia predokhraneniia grunta ot promerzaniia]

Up to 40% of the volume of ground work during construction of railroad roadbeds is carried out during the winter. In these conditions the working

of pits and depressions follows laborious processes of soil loosening by explosive or mechanical means. During the construction of the roadbed of secondary tracks the loosening of soils by explosion leads frequently to collapses of the operating track. Therefore there is great practical interest in the experience accumulated in the conservation of open pit soils from seasonal freezing by means of quick-hardening foam plastic on the basis of ureaformaldehyde resin. The soil heated by this method is found in a practical condition before working the open pit, thanks to which construction machines can be operated near to summer norms. The article goes on to develop a definition of the necessary thickness of the heating layer effectively protecting the soil from seasonal freezing. It is important, during design of the foam plastic insulation for depression in the secondary track, to ensure rational construction of the heat-insulating layers of foam plastic on road slopes and shoulders. The authors carried out verification calculations for wet ureaformaldehyde foam plastic with humidity of 20%. [Russian]

Full translation available for reference. Contact Technology Planning Officers, Office of Research and Development, Federal Railroad Administration,

Tkachevskii, ID Filippov, GS Riabov, VM *Transportnoye Stroitel'stvo* No. 9, 1973, pp 5-7

ACKNOWLEDGMENT: FRA

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00 130258

**CALCULATION OF THE THICKNESS OF A HEAT-INSULATION PROTECTION FROM FOAM PLASTIC [Raschet tolshchiny teploizoliruiushchei zashchity iz penoplastov]**

Generally defined are the necessary layers of the covering and the necessary relationship of the gaps to the areas of the slabs which ensure the depth of the soil freezing beneath the covering up to a given size (taking into consideration not permitting freezing below the covering). In table 1 are set out the basic calculation characteristics of the constructional foam plastics having limits of stability to a pressure of not less than 3 kilograms of force per square centimeter, which can be successfully utilized in the capacity of anti-heaving heat-insulating means. Table 2 lays out analogous characteristics of several ballasts and soils. The volume weight, thermal conductivity, and volume thermal capacity in foam plastics is many times smaller than in thawed and frozen ballasts and soils. Table 3 provides technical indications for the relationship of the freezing depth of anti-heaving material to the freezing depth of the soil which is located above the level of the soil waters. Table 4 shows the results of calculations for two test sections. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

Shakhuniants, GM Voitov, SA *Put' i Putevoye Khozyaistvo* No. 12, pp 38-40, 5 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novoryazanskaya ul., Dom 12, Moscow 288, USSR

00 130259

**ELIMINATION OF HEAVING WITH FOAM PLASTIC PROTECTION [Likvidatsiya puchin teploizoliruiushchei zashchitoi iz penoplastov]**

A significant portion of our national railroads are in regions with bleak climates and permafrost. The construction of the roadbed here has a series of peculiarities, one of which is the prevention of frost reception in the soils and the formation of heavings. In winter freezing it is usual in depressions and on level spots that more or less equivalent heaving of the track occurs for great stretches, which practically does not cause inadmissible alteration of the profile. In separate places, on the strength of some or another local reasons an equivalent heaving is destroyed and its local alteration appears in the form of protruberances, indentations, or drops in pressure, generally called heavings. The observations of heavings on USSR railroads revealed that in approximately 40% of cases there are protruberances, in 57% indentations, and in 3% drops in pressure. Drying of the soil for the prevention of heaving turns out to be completely effective only when the drainages (including gutters) intercept the water of the permeable water-bearing layer which feeds the heaving soils: therefore it has a limited application. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

Shakhuniants, GM *Put' i Putevoye Khozyaistvo* No. 10, 1973, pp 18-20, 7 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novoryazanskaya ul., Dom 12, Moscow 288, USSR

00 130260

**CALCULATION OF ANTI-HEAVING CUSHIONS [Raschet protivopuchinykh podushek]**

The thickness of anti-heaving cushions or the height of the hoisting are ordinarily defined so that the soil beneath the cushions (or, generally speaking, beneath the non-heaving soil) will not heave. The limit of the heaving stays somewhat away from the border of the freezing. This is equal to .5 m at a freezing depth of 1.0-1.5 m and .15 at a freezing depth over 2 m. This article elaborates a twelve-step operational calculation in order to develop the subject. Extremely detailed figures are included to illustrate the computations. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Shakhuniants, GM

Institute of Engineers for Railroad Transportation Proceeding Ts.N.I.I. No. 273, No Date, pp 13-25, 8 Fig., 10 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

00 130261

**THE STRUGGLE AGAINST ICE LAYERS ON THE TAISHET-LENA RAILROAD [Bor'ba s naleddiami na zheleznoi doroge Taishet-Lena]**

The data encompasses the period of observation from 1947 to 1960 and includes materials from special research begun in 1958 with a view to illuminating peculiarities of the development of ice layers and their negative influence on railroad construction in bleak northerly conditions of East Siberia. Ice layers within the limits of the Taishet-Lena railroad are extensive. Over the research period 104 spots were noticed, although this figure had grown from 42 to 63 to the present number. They were distributed along the entire line, but the overwhelming majority were in the eastern half of the line. This was explained by the presence of specific physical geographical and geological conditions conducive to the development of ice formation processes. The basic ones are a bleak climate, the presence of insular perennial permafrost, the increase of the water bearing ability of the rocks, and a richness of exits for the sources of the subterranean waters onto the diurnal surface. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Bol'shakov, SM

Institute of Railway Transportation Engineers Proceeding No. 22, 1961, pp 99-114, 6 Fig., 14 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Institute of Railway Transportation Engineers Novosibirsk, USSR

00 130262

**PROBLEMS OF EVALUATION AND CALCULATION OF THE THERMAL AND FORCE ACTION OF ICE LAYERS ON ARTIFICIAL INSTALLATIONS [Voprosy otsenki i ucheta termicheskogo i silovogo vozdeistviia naledei na iskusstvennye sooruzheniia]**

The action of ice layers on the condition and operation of artificial constructions can appear in the following aspects: (a) surface coverage of bridges and culverts by ice obstruction of filtering dams leading to a lowering of the water permeable capability of constructions in the spring, as well as the danger of ice escape onto the road and the interruption of traffic; (b) force and mechanical action on the elements of construction in the form of horizontal pressure of the ice during its thermal expansion, vertical pressure (heaving) arising during the development of the hydrostatic

pressure of the ice water, and the destruction of elements during dam ruptures; (c) heat-insulating action on the foundations of constructions in the form of melting or cooling effects leading to the development of general deformations of bridge foundations. The indicated aspects of ice actions to some degree affect the longevity and the reliability of water-permeable constructions and, naturally, must be calculated in the form of special engineering computations and requirements. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Dmitriev, Iu V Smyshliaev, BN  
Institute of Railway Transportation Engineers Proceeding No. 170, No Date, pp 96-109, 5 Fig., 11 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Institute of Railway Transportation Engineers Novosibirsk, USSR

00 130263

**ANTI-ICING MEASURES FOR SMALL ARTIFICIAL INSTALLATIONS AND SOIL ROADBEDS IN REGIONS OF DENSE PERMAFROST [Protivonalezhnye meropriiatiia u mal'nykh iskusstvennykh sooruzhenii i zemlianogo polotna v raionakh sploshnoi vechnoi merzloty]**

In regions of dense permafrost ice layers are generally found in continual and periodically acting currents of water, as well as in hollows inundated by soil and subterranean waters. In order to analyze ice processes, and determine antifreeze measures, it is expedient to divide ice passages into the following groups: (a) ice layers of surface waters (river and spring); (b) ice layers of subterranean waters; (c) ice layers of soil waters (below-freezing); (d) ice layers of mixed waters. The conclusions are drawn as follows: (1) For dense permafrost regions the passage of small water current and springs in constructions with no ice layer formation, and aided by open and heated troughs, or only by means of concentrating the water current, can not be recommended in view of large heat losses; (2) Drains are very effective anti-ice means when applied in channels and for intercepting subterranean and soil waters in hollows. During the process of designing the drainages, measures must be envisaged which prevent the freezing of water in them, in collection and transportation; (3) A retention of the ice layer above the artificial constructions should be recommended in order to control spring and mixed ice layers in valleys with insignificant gradients; (4) Frost-waterproof belts consisting of vertical and horizontal waterproof shields can be applied to control ice layers fed by sub-freezing waters; (5) Planning the soil roadbed of small bridges and culverts in dense permafrost regions can be done in a unified complex with antifreeze constructions. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Merkulov, DM Kuz'minykh, AI  
Institute of Railway Transportation Engineers Proceeding No. 102, 1970, pp 156-164, 3 Fig., 4 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Institute of Railway Transportation Engineers Novosibirsk, USSR

00 130264

**BASIS OF THE DIMENSIONS OF FROZEN STRIPS AT SMALL BRIDGES AND CULVERTS [Obosnovanie razmerov merzlotnykh pojasov u mal'nykh mostov i trub]**

To control soil ice layers on the Amur-Yakutsk main line, frost belts were applied. These were trenches located perpendicularly to the direction of the motion of the soil waters. The width was 5-10 m, depth 0.5-1.0 m, and the trench was located 50-100 m from the protected object. It is known that moss, peat, and sod possess great thermal resistance. During excavation of the canal they move away, provoking accelerated freezing of the soil in that location, and quicker (relative to natural conditions) confluence of the seasonal freezing with the water resistance. Beneath the canal there appears a frost dike, fencing off the track by soil waters which escape to the surface above the canal, where they freeze, forming an ice layer. Consequently, the frost belt provokes the formation of an ice layer in a spot safe for construction. The fundamental geometrical dimensions of the frost belts are depth and breadth. These are discussed in the report, and ways for determining them are revealed. The depth depends upon the power of the soil flow, the level of soil waters relative to the diurnal surface, and other

factors. The breadth is determined independently of the power of the water bearing layer, soil type, and inundation, and regional climatic conditions. This is connected to the drop of the permafrost border below the trench, leading to the fact that in the winter the trench can not intercept all the soil waters and cause natural formation of ice layers. The author therefore proposes a frost-impermeable screen consisting of vertical and horizontal screens. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Merkulov, DM  
Institute of Railway Transportation Engineers Proceeding No. 90, No Date, pp 211-215, 2 Fig., 6 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Institute of Railway Transportation Engineers Novosibirsk, USSR

00 130265

**BRIDGE PIER FOUNDATIONS ON PERMAFROST SOILS**

[Fundamenty opor mostov na vechnomerzlykh gruntakh]

Small and medium sized bridges in the northern constructional climatic zone are at present built with the use of standardized plans specially worked out for this zone. Nevertheless there are many deficiencies. These constructions are divided into two groups: the first includes foundations on a natural or pile base with supporting grillage foundation constructed by the traditional foundation pit method. The second group contains pile base foundations of scaffold bridges, as well as other types of foundations with slab grilling lifted over the road surface. The first group is constructed with a significant volume of earth works in permafrost soils, work in the placing of monolithic concrete, as well as with significant change of the negative character in thermal mode of the frost foundation and the soil surrounding it. These changes are connected with defrosting of the frost soil of the foundation and the walls of the pits under the influence of heat elaboration of the monolithic concrete and its exothermic nature. The article goes on to discuss various problems connected with thermal regimens, seasonal work production, and various insufficiencies connected with both types of foundations. Fulcrum foundations of a columnar type are most promising in their technical economic, technological constructional and operational indices for any frosty-soil conditions, inasmuch as they allow the full exclusion of work consuming labor on the pit foundation, the completion of concrete work at low temperatures, full mechanization of all basic processes, and a significant decrease in work expenditures. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Solov'ev, GP Blinkov, LS Gugustsidze, GN *Transportnoye Stroitel'stvo* No. 11, 1974, pp 10-12, 4 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya p1. 32/34, Moscow G-200, USSR

00 130266

**INSTALLATION OF A PIPE-TYPE FOUNDATION FOR BRIDGE PIER [Sooruzhenie stolbchatogo fundamenta mostovoi opory]**

During the construction of the foundation of a large railroad bridge on one of the northern rivers the builders encountered a series of difficulties connected to the construction of boreholes of 1.6 diameter in the rock base of the casings. In the river bed the rock type had a sloping surface, making the process of drilling the boreholes difficult, because in the gaps between the blade of the small and the surface of the rock the loose soil flowed in intensively during drilling. The foundation was projected as lying upon thirteen pipe castings. The most effective method for the construction of the boreholes in the base of the casings, in the presence of loose pressuring of the blade of the casing on the rock and the intensive flowing in of sand into the borehole, was the application of a metallic tube in conjunction with the concrete lock of the pipe. Boreholes were drilled by these means in the foundations of all remaining casings. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Smirnov, VN *Transportnoye Stroitel'stvo* No. 3, 1969, pp 12-14, 3 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya p1. 32/34, Moscow G-200, USSR

00 130267

**PIPE-TYPE FOUNDATIONS: A NEW AND PROMISING DESIGN FOR BAM BRIDGES** [Stolbchatye opory-novaia, perspektivnaia konstruktsiia dlia mostov BAM]

The experience of construction and operation of small and medium railroad bridges in regions of permafrost soil distribution exposed the substantial insufficiencies of traditionally constructed foundations. Massive and standing foundations on natural bases require large expenditures of manual labor because the foundation pits for the foundations must be dug by pneumatic drills, and this alone aggravates the possibility of degradation of the permafrost, leading to deformation of the foundations during operation, and sometimes during the construction period as well. The construction of massive foundations, including the block ones, involves large amounts of concrete ("wet") labor, which carries with it supplementary expenditures for ensuring the quality of concrete in the cold period and the organization in each section of its own management of concrete. The pile foundations which were until lately considered to be the best construction for the permafrost regions propose the sinking of significant quantities of piles (8-20) upon a small area, which seriously complicates the conditions for drilling and their installation into the boreholes. The experience of bridges with columnar foundations revealed their promise and allows their recommendation for further application. Lately pipe-type foundations have been proposed for the Bajkal-Amur main-line railroad, which fully excludes the foundation pit construction method. Calculations and practice show that the labor consumption for pipe-type foundations is two to three times less than for foundations on a natural base; this significantly economizes materials and lowers construction time sharply. Pipe-type foundations allow the reduction to a minimum of the "wet" processes during installation and transferences of the preparation of the reinforced concrete construction from the construction area to the base plants, thus allowing the quality of construction to be raised. In comparison with pile foundations the quantity of boreholes is sharply lowered; this also reduces construction time and improves drilling and installation conditions. In addition, the construction of pile-type foundations significantly decreases the possibility of degradation of the permafrost. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Riazanov, Iu S Iampol', AG

Institute of Railway Transportation Engineers Proceeding No. 170, No Date, pp 201-205, 2 Fig., 2 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Institute of Railway Transportation Engineers Novosibirsk, USSR

00 130268

**HANDBOOK FOR THE CORRECTION OF RAILWAY TRACK ON HEAVING GROUND** [Instruktsiia po ispravleniiu zheleznodorozhnogo puti na puchinakh]

A heaving is considered to be a local intense rise of a deformation of the position of the track in transverse and longitudinal profile, arising as the result of the heaving of frozen soils of the roadbed and the ballast layer. Heaving develops as the result of increases in the volume of the frozen soil of the roadbed or the ballast layer as the result of freezing of water in it and the formation of icy impurities in the form of a lens, interlayer, or streak. The icy impurities are formed from water contained in the soil or in the ballast layer below the freezing and advancing into the freezing layer from the contiguous zones of the uniform soil. The chapters cover such topics as the technical requirements for the correction of the track on heaving, heaving blocks and spikes, regulations for the application of heaving blocks and spikes, fundamental rules for the correction of the track on heavings, means for the correction of the track, composition of the measuring work (with ranging rods), work procedures during heaving; work procedures during settlement of the heavings by means of gradual lowering, and finally, work procedures during settling of the heaving by means of incrementation. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Tsepushelov, A Naumov, A

USSR Ministry of Railways 1969, pp 65, 40 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

00 130606

**COMPUTER ANALYSIS OF SEGMENTALLY ERECTED PRECAST PRESTRESSED BOX GIRDER BRIDGES**

The economic advantages of precasting can be combined with the structural efficiency of prestressed concrete box girders for long span bridge structures when erected by segmental construction. The complete superstructure is precast in box segments of convenient size for transportation and erection. These precast segments are erected in cantilever and post-tensioned together to form the complete superstructure. This report details the development of an analysis technique with an associated computer program to permit efficient analysis of constant depth segmental prestressed concrete box girders at all stages of erection. An existing box girder analysis program developed for analysis of completed structures was substantially altered to make it applicable to the multistage construction problem. The computer program has been written to simulate the complete construction sequence after a reasonable amount of user-generated data. The program provides a complete analysis for stresses and deflections at each stage of construction and will, at the user's option, compute revised tendon stresses for all tendons stressed earlier in the sequence and bonded by grouting. The use of the computer program is demonstrated by means of several practical examples, including an analysis of the first bridge of this type in the United States, erected at Corpus Christi, Texas. The general applicability of the program was verified in a related study by Kashima wherein measurements were made in a realistic model study of the Corpus Christi bridge and good correlation was obtained. /FHWA/

Sponsored by Texas State Department of Highways and Public Transportation in cooperation with FHWA.

Brown, RC, Jr Burns, NH Breen, JE

Texas University, Austin, Federal Highway Administration, (RR 121-4) Res. Rpt. CFHR-3-5-69-121-4, FHWA-RD-75-S0415, Nov. 1974, 245 pp SPONSORING AGENCY:

ACKNOWLEDGMENT: Federal Highway Administration (S-0415), NTIS ORDER FROM: NTIS

PB-248035/8ST, DOTL NTIS

00 133227

**DEMONSTRATION OF ACOUSTICAL UNDERGROUND SURVEY SYSTEM IN THE WASHINGTON METROPOLITAN AREA**

The purpose of the subject study was to demonstrate current capabilities of Acoustical Surveying in conjunction with tunnelling operations to aid in geologic determination and prediction. The Holosonics Acoustical Survey system served as the basic equipment for the survey program. Peripheral equipment such as a fast transient recorder, perforated paper tape punch and CRT storage monitor was used to implement the system. Interfacing and field packaging were fabricated by Holosonics to allow use as an integral system. New computer software was applied to handle the changed input format and to refine the output. Five-hundred-and-ten feet of drill hole were logged in five separate holes requiring four field mobilizations. Four short holes totalling 210 feet were logged under the equipment and software calibration phase. The fifth hole was a 270 feet long cored hole.

Supersedes PB-247221.

Price, TO

Holosonics, Incorporated, Federal Highway Administration Final Rpt. FHWA/RD-75-82, June 1975, 136 pp

Grant NSF-GI-41356

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-251661/5ST, DOTL NTIS

00 133288

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. STRUCTURAL DESIGN**

Contents: Structural design guidelines: Datum table; Clearances; Loads and stresses to be used in designing subways, tunnels and elevated structures; Details of design for structural steel; Design columns; Design of concrete and reinforced concrete structures; Water proofing of subways; Natural ventilation design criteria between stations.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-

09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-3, Mar. 1975, 125 pp  
 ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-251644/1ST, DOTL NTIS

00 133289

**NEW YORK CITY TRANSIT AUTHORITY DESIGN  
 GUIDELINES. CONSTRUCTION**

Contents: Construction guidelines: Underpinning; Decking; Maintenance, support and protection of utilities; Excavation; Steel erection; Restoration; Hard rock tunneling; Mixed face tunneling; Soft ground tunneling; Pressure grouting and graveling.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-4, Mar. 1975, 186 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-251645/8ST, DOTL NTIS

00 133291

**NEW YORK CITY TRANSIT AUTHORITY DESIGN  
 GUIDELINES. HYDRAULICS, ELECTRIC DUCTS AND  
 PLUMBING**

Contents: Hydraulics; Electric ducts; Electric duct manholes; Plumbing.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-6, UMTA-IT-09-0014-75-6, 52 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-251647/4ST, DOTL NTIS

00 133293

**NEW YORK CITY TRANSIT AUTHORITY DESIGN  
 GUIDELINES. EQUIPMENT**

Contents: Equipment guidelines: General criteria; Auxiliary electrical power and lighting; Heating; Ventilation and air cooling; Escalators; Pumps and ejectors; Fire lines; Direct current connections.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-8, UMTA-IT-09-0014-75-8, Mar. 1975, 243 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-251649/0ST, DOTL NTIS

00 133298

**PROCEEDINGS OF ROADBED STABILIZATION LIME  
 INJECTION CONFERENCE HELD AT LITTLE ROCK,  
 ARKANSAS, ON AUGUST 21-22, 1975**

Proceedings of Roadbed Stabilization Lime Injection Conference includes twelve technical papers that were presented at the conference on August 21 and 22, 1975 in Little Rock, Arkansas. The papers document the state of knowledge and related subjects on lime pressure injection stabilization of problem railroad subsoils. The related papers are on electro-chemical stabilization, finite element analysis of roadbeds and nondestructive testing of roadbed soils. These proceedings are the first to be published on the subject of lime pressure injection soil stabilization.

Blacklock, JR  
 Arkansas University, Little Rock, Federal Railroad Administration  
 FRA/ORD-76-137, Nov. 1975, 267p

Contract DOT-OS-40107

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-251681/3ST, DOTL NTIS

00 133996

**EFFECT OF LIME TREATMENT ON THE RESILIENT  
 BEHAVIOR OF FINE-GRAINED SOILS**

Lime treatment of fine-grained subgrade soils has definite potential for beneficially altering subgrades softening due to high moisture contents and freeze-thaw action. The effects of high moisture content and freeze-thaw cycles on the resilient response of a number of untreated and lime-treated soils are examined. A finite element procedure is used to evaluate the structural response of a flexible pavement on untreated and lime-treated subgrades. The analysis reveals that high moisture contents and freeze-thaw action in the subgrade have a detrimental effect on the magnitude of pavement response parameters and that lime treatment of the upper layer of the subgrade causes a substantial improvement in pavement response.

Robnett, QL Thompson, MR (Illinois University, Urbana) *Transportation Research Record* No. 560, 1976, pp 11-20, 11 Fig., 2 Tab., 15 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

00 133998

**THE WACO PONDING PROJECT**

This report presents results of field studies conducted between 1957 and 1972 on the effectiveness of ponding and lime stabilization of clay subgrade to minimize volume change beneath portland cement concrete pavements. Potential vertical rise (PVR) was calculated to identify sections in need of ponding, and the relationship of PVR to roughness and heaving of pavement is presented. The thickness of asphaltic concrete overlay required for pavement over untreated subgrade is compared to that required for concrete pavement over lime-stabilized subgrade, some of which was ponded. Although a study of underdrains was not intended as part of this project, it became noticeable that the result of connecting perforated underdrains to ditch drop inlets was to increase heaving and overlay repair thicknesses. A method for determining desired moisture content is presented, and it correlates fairly well with moisture contents obtained from below pavement after several years.

McKinney, RL, Jr (Texas Highway Department); Kelly, JE (Tippetts-Abbott-McCarthy-Stratton); McDowell, C (Texas University, Austin) *Transportation Research Record* No. 560, 1976, pp 31-43, 10 Fig., 2 Tab., 3 Ref.

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DOTL JC

00 136565

**DETERMINING THE ELASTIC MODULUS OF A ROCK MASS  
 BY MEASURING THE DEFORMATIONS PRODUCED BY  
 CONCENTRATED LOADS IN AN EXPERIMENTAL TUNNEL**

Within the sphere of technical problems associated with the design of large civil engineering works that involve large areas of rock or earth masses (foundations for dams or large buildings, tunnel excavations, etc.), it is becoming increasingly urgent to find more accurate ways of establishing the parameters that relate to geomechanical characteristics. The problem of determining the elastic modulus of a rock mass by means of in-situ tests is examined. To this end an exact theoretical interpretation of the jack loading test in an experimental tunnel of circular cross-section is presented. The interpretation relies upon experimental determinations on fleximetric specimens taken from the tunnel generatrices under load. Additional considerations are given on the applicability and approximation of the method, with reference to specific examples.

Goffi, L 1963, 18 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

UCBL-Trans-10729, DOTL NTIS



00 136885

**EVALUATION OF STEEL BRIDGE INSPECTION INSTRUMENTS: ACOUSTIC CRACK DETECTOR (ACD)/MAGNETIC CRACK DEFINER (MCD)**

This report discusses the field testing and evaluation of a steel bridge inspection device developed for FHWA by the Southwest Research Institute and tested in cooperation with ten participating state highway departments including Connecticut, California, Montana, Idaho, Pennsylvania, Ohio, Georgia, Texas, Arkansas, and Virginia. The device was used on various types and ages of steel bridges ranging from wrought iron trusses to modern bridge steels. The study concluded that the disadvantages with conventional non-destructive test equipment have not been eliminated with the ACD/MCD system: that is, extensive operator training is still required, and little or no production rate of inspected members of bridges is feasible. The difficulties encountered in characterizing the ACD unit to the steel being surveyed would limit its practical use to indepth inspections by trained personnel of structural details susceptible to fatigue cracking on relatively new bridges. Cracks observed by visual inspection can be verified and defined on flat smooth surfaces by the ACD/MCD units.

Lizzio, AM Nelson, DS  
Federal Highway Administration Final Rpt. FHWA/RD-76-502, Jan. 1976, 50 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-252323/1ST, DOTL NTIS

00 136906

**INVESTIGATION OF STEEL TUNNEL SUPPORTS**

A series of 18 steel ribs with 10 ft-radius arches and 7-ft straight legs were tested to investigate the effect of loading geometry, eccentricity of load, and various section shapes used for making the ribs. It was found that symmetrical loading about the rib center line gives higher rib capacity and that closed section shapes resist eccentrically applied loads much more effectively. Square structural-tube ribs filled with concrete and one square structural tube rib with sleeve connections were tested. The practicality of using ribs made of closed-section telescoping segments is discussed. It is found that the greatest problem with ribs of this type is the tolerances required in the manufacture of sections that must slide within one another. Sleeve connections are evaluated and it is found that tolerances in section sizes are also a problem in making this type of connector practical. A study of steel rib behavior with variation of blocking stiffness and connection stiffness is described, using a computer analysis. These parameters were constant in the test series described above. Finally, results of the tests on ribs are compared with the analysis commonly used for design and is found to predict their behavior with reasonable consistency.

Gaylord, EH Paul, SL Sinnamon, GK  
Illinois University, Urbana, Federal Railroad Administration Final Rpt. UIIU-ENG-75-2012, FRA/ORD-75/92, Aug. 1975, 170 pp

Contract DOT-FR-30022

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-253005/3ST, DOTL NTIS

00 137155

**TUNNEL COST MODEL**

The Tunnel Cost Model, developed at MIT's Department of Civil Engineering, follows in concept the current estimating practices of contractors, owners, and designers. It is able to treat explicitly many of the major uncertainties of tunnel construction, and its speed and level of detail make it ideal for evaluating alternatives in tunnel site location or method of construction. Because it can operate at several levels of detail, the Tunnel Cost Model adapts readily to the diverse needs of contractors, owners, construction managers, and engineers. This brochure highlights the main features of the model.

Massachusetts Institute of Technology, National Science Foundation  
NSF/RA/T-75/046, July 1975, 22 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-252624/2ST, DOTL NTIS

00 137202

**METHODS FOR GEOTECHNICAL OBSERVATIONS AND INSTRUMENTATION IN TUNNELING. VOLUME 2. APPENDICES**

Volume 2, describing in greater detail instrumentation programs for the various aspects of tunnel design and construction, contains the appendices describing instrumentation for monitoring displacements, strains, loads, and stresses and groundwater pressures. Other appendices cover investigations for ground vibration and blasting damage in rock; microseismic detection; significant rock properties in tunneling; and a listing of instrumentation specialists, suppliers and manufactories. Appendix H contains an extensive bibliography.

See also PB-252585.

Cording, EJ Hendron, AJ Hansmire, WH Mahar,  
JW MacPherson, HH  
Illinois University, Urbana, National Science Foundation NSF/  
RA/T-75/076B, NSF/RA/T-75/076B, Dec. 1975, 287 pp, App.

Grant NSF-GI-33644

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-25286/3ST, DOTL NTIS

00 137203

**METHODS FOR GEOTECHNICAL OBSERVATIONS AND INSTRUMENTATION IN TUNNELING. VOLUME 1**

Volume I describes instrumentation programs for rock and soil tunnels, emphasizing the coordination of the instrumentation program with the various aspects of tunnel design and construction. Seventy-three illustrative figures, and eleven tables of data are included in this volume.

See also PB-252586.

Cording, EJ Hendron, AJ Hansmire, WH Mahar,  
JW MacPherson, HH  
Illinois University, Urbana, National Science Foundation NSF/  
FA/T-75/076A, Dec. 1975, 307 pp

Grant NSF-GI-33644

ACKNOWLEDGMENT: NTIS  
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PB-252585/5ST

00 137209

**SCOUR AND FILL IN EPHEMERAL STREAMS**

In this report the classical concept that mean bed elevation over an entire stream reach is lowered by scour during flood-wave passage and is restored by deposition in the waning flood phase (mean-bed scour and fill) is challenged. The alternative that both scour and fill occur concurrently at different migrating loci within a reach (local scour and fill) is more consistent with published field data. The field and laboratory investigations reported suggest that mean-bed scour and fill in a uniform channel is minor compared to local scour and fill caused by bedform migration, and that maximum local scour and fill may occur on the waning flood in some instances.

Also available as California Inst. of Tech., Pasadena, Div. of Geological and Planetary Sciences, Rept. No. contrib-2695.

Foley, MG

California Institute of Technology Intrm Rpt. KH-R-33, ARO-  
1108.3-G5, Nov. 1975, 204 pp

Grant DAHC04-74 (G-0189)

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A025264/3ST

00 137236

**SURVEY OF EXCAVATION RESEARCH FACILITIES IN THE UNITED STATES**

This report presents the results of the first survey of excavation research facilities in the United States. A questionnaire was designed and sent to 437 organizations, including universities, research institutes, laboratories, federal agencies, state agencies, local agencies, consulting firms, contractors, and manufacturers. A total of 115 responses, of which 76 were positive, were

obtained. The data obtained from these replies are presented in this document. The information includes areas of competence, laboratory facilities with an emphasis on unique or special apparatus, field instrumentation and equipment, available field sites, program experience, and key personnel. Thus, a capsule summary of the capabilities of an organization can be obtained from this survey.

Singh, MM

IIT Research Institute, National Science Foundation Final Rpt. II-TRI-D6094-FR, NSF/RA-760050, Mar. 1976, 158 pp

Grant NSF-GI-41307

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-252369/4ST, DOTL NTIS

00 137243

**STREAM EROSION AND SCOUR (A BIBLIOGRAPHY WITH ABSTRACTS)**

Studies on erosion and scouring processes and actions of rivers and streams are cited. Erosion of stream banks, bridge supports, levees and other hydraulic structures are covered. Excluded are reports only concerned with sediment transport and erosion from surface runoff. (Contains 45 abstracts)

Brown, RJ

National Technical Information Service Biblio. May 1976, 50 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PS-76/0381/4ST, DOTL NTIS

00 137255

**VALIDATION OF SOIL STABILIZATION INDEX SYSTEM WITH MANUAL DEVELOPMENT**

Contents: Soil sample suite; soil stabilization with cement; Soil stabilization with lime; Soil stabilization with asphalt; Performance benefits of stabilized pavement layers; When to use stabilization; Residual strength requirements for stabilized layers.

Currin, DD Allen, JJ Little, DN

Frank J. Seiler Research Laboratory, (AF-7903) FJSRL-TR-76-0006, Feb. 1976, 565 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A024549/8ST, DOTL NTIS

00 137299

**HYDRAULIC TRANSPORTATION AND SOLIDS SEPARATION OF EXCAVATED MATERIALS IN TUNNELS. FINAL REPORT**

The purpose of this report is to provide a detailed account of the techniques employed in constructing tunnels, i.e., transit guideways, within the St. Peter sandstone by hydraulic means. The St. Peter is a unique, well compacted layer of granular material which can be excavated with relative ease (soft ground techniques) yet behaves similar to a moderately competent hard rock surrounding an opening. This hydraulic method has resulted in tunneling costs substantially below the national average for soft rock, and may provide a basis for reducing cost of tunnel construction in similar materials. Important in hydraulic methods is a tremendous consumption of water. Solutions for the disposal of this water have been to effect a coarse separation and dispose of the fines bearing effluent in the environment. Environmental concerns prohibit this type of pollutant, therefore alternate proposals for the disposal of the contaminant effluent must be developed. Several possibilities are suggested within the text and methods are discussed which will satisfy conditions imposed by each alternative.

See also RRIS 00A 058353, Bulletin 7701.

Nelson, CR Yardley, DH Havrilak, RJJ Miller, SM

Minnesota University, Minneapolis, Federal Highway Administration DOT/TST-76/70, July 1975, 178 pp

Contract DOT-OS-40087

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254096/1ST, DOTL NTIS

00 137411

**EVALUATION OF FLOOD RISK FACTORS IN THE DESIGN OF HIGHWAY STREAM CROSSINGS. VOLUME III. FINITE ELEMENT MODEL FOR BRIDGE BACKWATER COMPUTATION**

A mathematical model describing the steady, two-dimensional subcritical flow in wide, heavily vegetated flood plains of bridge waterways has been developed using the finite element method of numerical analysis. The basic fluid equations comprising the model consist of the phenomenologic motion equations and the continuity equation, which are solved simultaneously by numerical methods to yield the spatial distribution of water surface elevations and velocities within the flow region for prescribing boundary conditions. The model simulates flow characteristics of arbitrary geometry. Hydraulic computations for various highway stream crossing orientations can be performed by the model. The model also simulates flow overtopping roadway embankments and performs hydraulic computations for a series of bridges across a stream valley without requiring prior assumption of the flow distribution for each bridge opening. The model has been tested for two example problems: a field site near Laurel, Mississippi, and for hydraulic flume data. In both examples good agreement between the model and the observed data was demonstrated.

See also Volume 1, PB-244486.

Tseng, MT

Water Resources Engineers, Incorporated, Federal Highway Administration Final Rpt. WRE-20810, FHWA/RD-75-53, Apr. 1975, 184 pp

Contract DOT-FH-11-7669

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254960/8ST, DOTL NTIS

00 137697

**MECHANIZED TUNNELLING--PROGRESS AND EXPECTATIONS. THE TWELFTH SIR JULIUS WERNHER MEMORIAL LECTURE OF THE INSTITUTION OF MINING AND METALLURGY**

Problems to be faced in the mechanization of underground excavation and support are outlined. The development of machinery for boring in hard rock is described. Improved design of cutters has increased penetration rates in hard rocks, increased cutter life and reduced costs. Research on the use of high pressure water jets and of high-energy impact hammer breakers for boring in hard rock is described. Problems of tunnelling in soft ground and possible solutions are discussed. Development of fluid pressure support of the tunnel face is outlined. /TRRL/

Robbins, RJ (Robbins Company)

Institution of Mining and Metallurgy Mar. 1976, 10 pp, 4 Fig., 12 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR-219543)

ORDER FROM: Institution of Mining and Metallurgy 44 Portland Place, London, England

00 137700

**MAINTENANCE OF SNCF UNDERGROUND STRUCTURES. THE BLAISY BAS TUNNEL [Entretien des ouvrages souterrains SNCF Tunnel de Blaisy Bas]**

Problems of stability arose in a tunnel along a heavily trafficked railway line, which had to be kept open to traffic during maintenance operations. The tunnel is built through marl, limestone, sandstone and dolomite. The drilling operations led to a modification in natural hydrogeology causing important movements of water in a terrain in which they did not occur before the construction of the tunnel. These movements were the cause of disorders. Strengthening of the line was carried out in 1922 and 1973. In 1973, two methods were used: (1) strengthening of the rock with bentonite-cement injection, and (2) installation of a dense network of cast-in-situ micro-piles. The first technique was used to fill pockets under the footing, thus improving the bearing capacity; the second formed a thick layer which replaced the shallow foundation. /TRRL/ [French]

Chavignaud, JP *Tunnels et Ouvrages Souterrains* No. 3, May 1974, pp 135-145, Figs., 1 Tab., Photos.



ACKNOWLEDGMENT: Central Laboratory of Bridges & Highways, France, Transport and Road Research Laboratory (IRRD-102293)  
ORDER FROM: ESL

00 138073

**MEASUREMENTS OF GROUND MOVEMENT AND LINING BEHAVIOR ON THE LONDON UNDERGROUND AT REGENTS PARK**

An investigation of ground movement and tunnel lining behaviour was carried out during the construction of the Fleet Line of the London Underground at Regents Park. For two tunnels, 4.15 m in diameter, constructed with expanded concrete linings at depths of 34 m and 20 m, 5 mm and 7 mm of surface settlement respectively were caused with a trough of settlement some 50-65 m wide at right angles to the tunnel axis. Comparing the settlements at various depths with those obtained for a tunnel of the same line constructed with cast iron linings at Green Park it was concluded that settlements for an expanded concrete lining were a little less than those for a cast iron one, which is to be expected in view of the more rapid rate of progress for the concrete lining and the fact that the ground is supported immediately after the passage of the shield. After a year, load cells at the axis and the crown of the lining showed that 0.51 and 0.31 of the overburden pressure had developed at these positions.

Barratt, DA Tyler, RG  
Transport and Road Research Laboratory LR 684, 1976, 12 pp, 24 Fig.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Transport and Road Research Laboratory Department of the Environment, Crowthorne RG11 6AU, Berkshire, England

00 138120

**IMPACT OF FLOOD PLAIN REGULATION ON RAIL TRANSPORTATION**

This viewpoint of an engineering and maintenance officer demonstrates concern for the effects of flood plain regulation on the maintenance of existing railroad facilities. It is noted that the regulations generally indicate that maintenance of existing facilities in flood plains will be permitted and that permits to perform routine maintenance work will not be required. The question is asked, however, where routine maintenance stops and constructions (e.g. ditching, widening or raising embankment, etc) that require a permit start. Issues such as reconstruction of facilities, the replacement of trestle with fill, and bridge replacement are discussed. The importance in consistency in regulations is emphasized. It is noted that flood plain regulation will require longer range planning in order to obtain the necessary permits for construction within a flood plain, and they may result in higher first costs. There will be compensating benefits such as the development of relatively fool-proof construction and the not insignificant benefit of management of the entire flood plain.

Presented at the TRB 54th Annual Meeting.

Bechly, DS (Illinois Central Gulf Railroad) *Transportation Research Circular* No. 178, June 1976, pp 7-10

ORDER FROM: TRB Publications Off

00 138135

**MORPHOLOGY AND PEDOLOGIC CLASSIFICATION OF SWELLING SOILS**

Swelling soils occur in nature in a predictable manner. The pedologist identifies, classifies, and characterizes these unique soils and delineates their occurrence on the landscape. The concept of Vertisols, for example, is that of a soil that is unstable because of a high content of expanding lattice clay. The morphology is marked by intersecting slickensides, parallelepiped structural aggregates, and horizons that are thin and poorly expressed near microhighs but that are thick and well expressed in microlows only a few feet (meters) away. Where not destroyed by man, these soils have gilgai relief. Soils having swelling potential but lacking the other features of Vertisols are classified in vertic subgroups of other soil orders. By definition, these soils have more than 35 percent clay within a designated control section and a coefficient of linear extensibility of 0.09 or more or a potential linear extensibility of 2.4 in. (6 cm) or more. Vertisols and soils in vertic subgroups of other orders have the common property of instability because of swelling. They have a high plasticity index and a high liquid limit. They are characterized by a high content of expanding lattice clays, particularly montmorillonite. The micromorphology of swelling soils reveals a fabric of oriented clay particles along short-range shear planes.

Report prepared for the 54th Annual Meeting of the Transportation Research Board.

Bartelli, LU McCormack, DE (Department of Agriculture) *Transportation Research Record* No. 568, 1976, pp 1-8, 4 Fig., 2 Tab., 17 Ref.

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00 138137

**PRESSURE-INJECTED LIME FOR TREATMENT OF SWELLING SOILS**

The pressure-injected lime technique for treating swelling soils is described and evaluated. Basic mechanisms of soil-lime reactions and pressure-injected lime are considered, and the effects of treatments with pressure-injected lime are discussed. Typical field experiences with pressure-injected lime are summarized, and the factors that appear to influence the effectiveness of the technique are identified. There are conflicting reports concerning the effectiveness of pressure-injected lime treatment of expansive soils. The condition most favoring the achievement of successful pressure-injected lime treatment of expansive soils is the presence of an extensive fissure and crack network into which the lime slurry can be successfully injected. The proposed treatment mechanisms (prewetting, development of soil-lime moisture barriers, and effective swell restraint with the formation of limited quantities of soil-lime reaction products) have validity. The relative significance of the prewetting and soil-lime pozzolanic reaction aspects of pressure-injected lime treatment has not been established. The various statements and reports in the literature and the information presented in the paper suggest that pressure-injected lime may not be effective under all circumstances but that in appropriate conditions it can be satisfactorily and economically used. It is indicated that appropriate guidelines and principles should be developed for evaluating (on a site-by-site basis) the potential effectiveness of pressure-injected lime treatment.

Report prepared for the 54th Annual Meeting of the Transportation Research Board.

Thompson, MR Robnett, QL (Illinois University, Urbana) *Transportation Research Record* No. 568, 1976, pp 24-34, 2 Fig., 32 Ref.

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00 138138

**MEASUREMENTS BENEATH THE SURFACE OF EXPANSIVE CLAY**

Several methods for predicting moisture movement and potential heave of expansive soils are available. In June 1973, a field experiment was initiated because a dearth of integrated field data precluded evaluation of these predictive methods. Various methods were developed and used to measure changes in density, water content, and soil suction in relation to surface and subsurface heave at depths to 15 ft (4.6 m) below an expansive clay surface. This paper describes the methods used, method of installation, and preliminary results.

Presented at the 54th Annual Meeting of the Transportation Research Board.

Stevens, JB Matlock, H (Texas University, Austin) *Transportation Research Record* No. 568, 1976, pp 35-47, 16 Fig., 8 Ref.

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00 138807

**STABILIZATION AND CONTROL OF LOCAL ROCK FALLS AND DEGRADING ROCK SLOPES**

The paper describes design and construction techniques for the stabilization and control of local rockfalls and the products of general degradation from rock slopes. Stabilization measures are discussed and illustrated by a series of idealized cross-sections and examples. Simple nomograms are developed for the design of rockbolt installations and rock-trap ditches. /Author/ /TRRL/

Fookes, PG Sweeney, M *Quarterly Journal of Engineering Geology* Vol. 9 No. 1, 1976, pp 37-55, 9 Fig., 1 Tab., 2 Phot., 17 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220232)

ORDER FROM: Geological Society Burlington House, Piccadilly, London W1V 0JU, England

00 138810

**BRAZIL'S UNDERGROUND MOVEMENT FOR AN UNDERGROUND REVOLUTION**

Both of Brazil's major cities of Rio de Janeiro and Sao Paulo are building underground railway systems through poor ground covered with buildings. Because of the treacherous conditions in Rio the cut-and-fill technique is being used. The ground is a mixture of clays, sands and salty water 2 M below the surface. In the city centre, where the line passes through shops on either side, building settlement is prevented by diaphragm walls and dewatering wells in the trench interior. Threading through the old services has been very difficult. Because of low wages it has been possible to employ over 8000 men in the construction of the 12 km tunnel. Costly method of waterproofing are employed. The new construction at Sao Paulo supplements the existing 17 km stretch that has been in use since September 1975. Most of the 28 km new line will be on the surface, but 9 km will be constructed by the cut-and-cover method, and 3.5 km in bored tunnel using full faced machines with precautions to reduce ground disturbance under buildings. /TRRL/

Reina, P *New Civil Engineer* Apr. 1976, pp 14-16, 8 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220215)

ORDER FROM: Institution of Civil Engineers 26-34 Old Street, London EC1V 9AD, England

00 139435

**PERMANENT WAY NO 59-60**

The design standards of the Sanyo Shin Kansen, the highspeed rail line extension of the original New Tokaido Line (NTL) to Hakata on the southern island of Kyushu, are based on the NTL specifications. Based on technological advancements and experience on NTL, along with eventual speed limit increase of NTL's 210 km/h to 260 km/h, several criteria have been changed. Construction started in 1970 and commercial service began in March 1975. Extensive detail is given in the chapters: Bridges of Sanyo Shin Kansen; Tunnels of Sanyo Shin Kansen; Construction of Shinkanmon Tunnel; Construction of Iwahana PC Truss Girder Bridge.

*Permanent Way* Vol. 16 N No. -3, May 1976, 58 pp, Figs., Tabs., Photos.

DOTL JC

ORDER FROM: Japan Railway Civil Engineering Association Kyodo Building, 18-7 Hagashi-Uyeno 2 Chome, Daito-Ku, Tokyo-110, Japan

00 139460

**SANTA FE: MAPPING A NEW 70-MILE LINE**

Santa Fe is using a combination of aerial photography, photogrammetry, transportation of data on punched cards for computer processing and an economic study of optimum layout in locating its new 70-mile New Mexico coal line. Environmental protection, including falcon nesting grounds and archeological sites, came in for special attention.

*Railway Age* Vol. 177 No. 5, Mar. 1976, pp 28-30

ORDER FROM: ESL

DOTL JC

00 139468

**ANALYSIS OF DYNAMIC RESPONSE OF RAILWAY BRIDGES**

No Abstract.

Kumar, A *Indian Railway Technical Bulletin* Vol. 31 No. 195, Nov. 1974, pp 113-119, 2 Tab., 17 Ref., 3 App.

ACKNOWLEDGMENT: UIC

ORDER FROM: Research Design and Standards Organization Alambagh, Lucknow 5, India

00 139507

**CORRELATIONS OF ROCK BOLT-SHOTCRETE SUPPORT AND ROCK QUALITY PARAMETERS IN SCANDINAVIAN TUNNELS**

Field observations at 14 civil engineering rock tunnel projects in Norway and Sweden have enabled empirical correlations to be drawn between three different rock quality parameters and the rock bolt-shotcrete supports used in loosening ground conditions. The three rock quality parameters used in the investigation are average discontinuity spacing, rock quality designation

(RQD), and seismic velocity ratio. Numerical values of each of these three parameters have been related to the three support classifications of maximum (two or more shotcrete applications, frequently with closely spaced rock bolts), intermediate (one shotcrete application, frequently with medium to widely spaced bolts), and minimum (none or medium to widely spaced bolts). These correlations offer the most realistic approach to the selection of a shotcrete design that has heretofore been possible. Laboratory model studies have been used to demonstrate the significance of joint orientation and tangential stress on the stability of an unsupported jointed medium. Both the failure mechanism and the mechanism of stabilization of an unsupported span have been described. The influence of intact material failures on the failure mechanism is particularly noteworthy. Several simple rigid block analytical models have been used to demonstrate possible shotcrete-rock interactions. They point out the importance of the rock-shotcrete bond strength in determining the support capacity of a discontinuous shotcrete tunnel lining.

Cecil, OS *Swedish Geotechnical Institute, Proceedings* No. 27, 1975, 275 pp, 65 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Swedish Geotechnical Institute Banergatan 16, S-115-26 Stockholm, Sweden

00 139527

**FIBROUS CONCRETE FOR THE EXTRUDED LINER SYSTEM**

Fibre reinforced, quick-setting cement concretes appear to be suitable materials for extruded tunnel liners. However, none of the quicksetting cements commercially available provides both the necessary working time and early strength without the use of admixtures. With careful mix design the fibre reinforced concretes are pumpable. The ultimate strength, creep, and ultimate moment-thrust interaction of these concretes are acceptable. Permeability is variable and depends primarily on the quick-setting cement used. Behaviour up to cracking is determined primarily by matrix quality; after a crack occurs behaviour is governed by fibre quantity and orientation.

Halvorsen, GT Kesler, CE Paul, SL (Illinois University, Urbana) *Tunnels and Tunnelling* Vol. 8 No. 5, July 1976, pp 42-46, 8 Fig., 11 Ref.

ACKNOWLEDGMENT: UIC

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DOTL JC

00 139572

**NEED FOR AND APPLICATION OF UTILITY-TRANSPORTATION COORDINATION**

This paper examines the increasing complexities involved in providing essential utility and transportation services. It concludes that a well-organized, representative coordination group is the best mechanism for improving interrelated utility-transportation activities. It identifies and describes key elements that should be considered during the process of forming local utility-transportation coordination groups. It describes how the Utility Location and Coordination Council of the American Public Works Association was organized and is preparing to help local groups improve their practices through a comprehensive national program, a program that is supported by a large number and variety of leading labor organizations. /Author/

Report prepared for the 54th Annual Meeting of the Transportation Board.

KuyKendall, CR (American Public Works Association) *Transportation Research Record* No. 574, 1976, pp 17-27, 4 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

00 139701

**LATERAL SUPPORT SYSTEMS AND UNDERPINNING. VOLUME 2: DESIGN FUNDAMENTALS**

This report provides current information and design guidelines on cut-and-cover tunneling for practicing engineers. The main emphasis is on the geotechnical aspects of engineering. Included in this volume is a state-of-the-art summary of displacements and lateral pressure. Other topics are basic concepts of soil mechanics, ground water in open cut, passive resistance, design aspects of lateral earth pressure, stability analysis of sheeted excavations, bearing capacity of deep foundations, and construction

monitoring. Detailed explanations of design methods and literature citations are included. Other reports prepared as part of the study are FHWA-RD-75-728, Volume I, Design and Construction; FHWA-RD-75-130, Volume III, Construction Methods, and FHWA-RD-75-131, Concepts for Improved Lateral Support Systems.

Also available in set of 3 reports as PB-257209-SET. See Volume I, RRIS 00 141250 and Volume II III, RRIS 00 139713.

Goldberg, DT Jaworski, WE Gordon, MD  
Goldberg-Zoino and Associates, Incorporated, Federal Highway Administration, (1363-Vol-2) Final Rpt. FHWA-RD-75-129, Apr. 1976, 49 pp, 59 Fig., 8 Tab., Refs.  
RESPONSIBLE INDIVIDUAL: Sallberg, JR (HRS-11)

Contract DOT-FH-11-8499

ACKNOWLEDGMENT:  
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PB-257211/3ST, DOTL NTIS

00 139713

#### LATERAL SUPPORT SYSTEMS AND UNDERPINNING. VOLUME 3: CONSTRUCTION METHODS

This provides specific design recommendations, design considerations, and construction techniques for the construction of lateral support systems and underpinning. The design considerations are presented for each technique or method (solider piles, steel sheeting, diaphragm walls, internal bracing, tiebacks, underpinning, grouting, and freezing). The factors affecting the design or implementation of these schemes are discussed. Construction techniques are presented, and literature references are provided for those seeking even greater detail. An overview of the construction methods compares the applicability of the techniques and the construction costs of each. Other reports developed from the study are FHWA-RD-128, Volume I, Design and Construction; FHWA-RD-129, Volume II, Design Fundamentals; and FHWA-RD-131, Concepts for Improved Lateral Support Systems.

Also available in set of 3 reports as PB-257209-SET, also see Volume I, RRIS 00 141250 and Volume II RRIS 00 139701.

Goldberg, DT Jaworski, WE Gordon, MD  
Goldberg-Zoino and Associates, Incorporated, Federal Highway Administration, (1363-Vol-3) Final Rpt. FHWA-RD-75-130, Apr. 1976, 480 pp  
RESPONSIBLE INDIVIDUAL: Sallberg, JR (HRS-11)

Contract DOT-FH-11-8499

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PB-257212/1ST, DOTL NTIS

00 139853

#### FATIGUE ANALYSIS FROM STRAIN GAUGE DATA AND PROBABILITY ANALYSIS

This report presents a rational approach for determining remaining fatigue life of a bridge. A methodology was developed to determine fatigue damage from a probability analysis of traffic data by reconstituting or synthesizing the load (traffic) history of bridges. A mechanical scratch gauge was used to obtain a short period of stress history of bridge members on the Central Bridge over the Ohio River at Cincinnati. Stress histories deduced from the strain gauge records were used to evaluate fatigue damage to the bridge. The remaining life of the bridge obtained by these two methods was then compared.

Prepared for the 54th Annual Meeting of the Transportation Research Board.

Deen, RC Havens, JH (Kentucky Department of Transportation) *Transportation Research Record* No. 579, 1976, pp 82-102, 13 Fig., 5 Tab., 10 Ref.

ORDER FROM: TRB Publications Off

00 139942

#### THE LOAD SPECTRUM FOR THE FRASER RIVER BRIDGE AT NEW WESTMINSTER, BC

To assure the safety of steel bridges on the Canadian National mainlines carrying more than 10 million gross tons per year, a method of fatigue

analysis and prediction has been developed. The 2,000-ft Fraser River Bridge near Vancouver, B.C., which had been built in 1904 was of special concern and was used for the initial study. This paper describes the load spectrum used to analyze the bridge with particular reference to the useful life of the hangers of the main 380-ft span. A firm maximum life could only be established with data on the loads to which the bridge has been and will be subjected. Historical data were scanned to produce the load spectrum for past traffic. Marketing projections were used for future estimates. The effects of unit trains and heavy cars have been studied. Experimental field measurements confirm the applicability of the traffic spectrum evaluation of stress cycles to the bridge members.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976. See also An Investigation of the Fatigue Damage in Members of the 380-ft Main Span, Fraser River Bridge, RRIS 00 139943.

Sweeney, RAP (Canadian National Railways)  
American Railway Engineering Association Proceeding Vol. 77 Bulletin 658, 1976, pp 561-577, Figs., 5 Tab., 12 Ref.

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00 139943

#### AN INVESTIGATION OF THE ESTIMATED FATIGUE DAMAGE IN MEMBERS OF THE 380-FT MAIN SPAN, FRASER RIVER BRIDGE

This paper uses the load spectrum defined by checks of past traffic and for future traffic based on marketing projections to evaluate the fatigue life of a bridge already over 70 years old. The Canadian National bridge near Vancouver, B.C., was built in 1904 of a weak design initially, and is today subjected to heavy unit train loads. Fatigue cracks can grow from riveted connections or other structural details such as pin plates and weldments. Strain gauge tests of certain bridge members were used to define the fatigue life of the hangers and stringers. Care in interpreting results and cautions about using field measurements are indicated.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976. See also The Load Spectrum for the Fraser River Bridge at New Westminster, B.C., RRIS 00 139942.

Fisher, JW Daniels, JH (Lehigh University)  
American Railway Engineering Association Proceeding Vol. 77 Bulletin 658, 1976, pp 577-597, 13 Fig., 17 Ref.

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00 139954

#### RAPID RECONSTRUCTION OF S.P.'S BURNED-OUT TIMBER TRESTLE APPROACH

A fire destroyed 1080 ft of the ballast-deck trestle approach to Southern Pacific's Feather River Bridge at Yuba City, Cal. SP has a standardized prestressed-concrete bridge which is used to replace timber trestles. The clearing of the site and use of the standardized components from other bridge projects all over the system for round-the-clock construction made possible resumption of traffic in just eight days.

Proceedings of the 80th Annual Convention of the American Railway Bridge and Building Association, Chicago, Illinois, 15-17 September 1975.

Fuller, TL (Southern Pacific Company)  
American Railway Bridge and Building Assoc Proc Paper 1975, pp 115-120

ORDER FROM: American Railway Bridge and Building Assoc 18154 Harwood Avenue, Homewood, Illinois, 60430

00 139955

#### CURRENT PRACTICES IN PILE FOUNDATION DESIGN AND CONSTRUCTION

Demand for economics in construction finds more powerful hammers driving lighter piles to greater resistance so that the piling may prove to be a weak link. The use of tubing, H-beam and precast concrete piles is discussed. Cast-steel tips for beams are discussed. The author sees continued need for timber piles and they may be improved with a boot to protect and improve penetration. Careful soils investigations are urged in advance of choosing pilings.

Proceedings of the 80th Annual Convention of the American Railway Bridge and Building Association, Chicago, Illinois, 15-17 September 1975.

Hunt, HW (Associated Pile & Filling Corporation)  
American Railway Bridge and Building Assoc Proc Paper 1975, pp  
108-115, 1 Fig.

ORDER FROM: American Railway Bridge and Building Assoc 18154 Har-  
wood Avenue, Homewood, Illinois, 60430

00 139956

**RENEWAL OF TIMBER DECKS ON STEEL BRIDGES WITH  
EPOXY-BONDED PRESTRESSED-CONCRETE SLABS**

Many of Santa Fe's aging steel girder bridges were converted to timber ballast decks in the 1920s. The ballasted-deck construction is highly desirable from a track maintenance standpoint but moisture retained in the deck causes steel corrosion and shortens paint life. The experimental program of renewing old timber decks with precast, prestressed concrete slabs bonded to the steel with epoxy grout was initiated to solve the problems. Transverse joints are epoxy bonded into a monolithic, water-tight deck. Lateral rigidity of the monolithic deck eliminated need to strengthen corroded lateral bracing and composite structure produced by bounding makes coverplate renewal unnecessary.

Proceedings of the 80th Annual Convention of the American Railway Bridge and Building Association, Chicago, Illinois, 16-17 September 1975.

Hyma, WR

American Railway Bridge and Building Assoc Proc Paper 1975, pp 43-48,  
5 Phot.

ORDER FROM: American Railway Bridge and Building Assoc 18154 Har-  
wood Avenue, Homewood, Illinois, 60430

00 139957

**TRENDS TOWARD BRIDGES BUILT WITH COMBINATIONS OF  
TIMBER, CONCRETE AND STEEL COMPONENTS**

This is a report on composite bridge structures prepared by ARB&BA committee. The techniques and materials may be used for new bridges or for repair of existing ones. Site conditions may restrict some choices and construction equipment and procedures on a specific railroad may restrict others. While a steel or concrete bridge with a ballasted deck is probably the best choice, it is also the most costly. Alternatives should be examined, particularly on secondary lines.

Proceedings of the 80th Annual Convention of the American Railway Bridge and Building Association, Chicago, Illinois, 15-17 September 1975.

American Railway Bridge and Building Assoc Proc Paper 1975, pp 39-42

ORDER FROM: American Railway Bridge and Building Assoc 18154 Har-  
wood Avenue, Homewood, Illinois, 60430

00 141097

**EFFECTIVE BREADTHS OF STACKED FLANGE PLATES IN  
PLATE GIRDER BRIDGES**

The effective breadths of stacked flange plates in various plate girders have been determined using the finite element method of analysis. Comparisons made between these effective breadths and those obtained from the Merrison shear lag rules for corresponding box girder flange plates indicate that, with the introduction of simple multiplicative factors, the rules could be applied to any girder having a practical arrangement of stacked flange plates.

Moffatt, KR (Imperial College of Science & Technology, England)  
*Institution of Civil Engineers, Proceedings* Vol. 61 No. t2, June 1976, pp  
410-424, 7 Ref.

ACKNOWLEDGMENT: EI

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00 141103

**EXTENSION OF THE PICCADILLY LINE FROM HOUNSLOW  
WEST TO HEATHROW CENTRAL**

The paper gives a history of events leading up to the authorization of the construction of the extension. Three separate contracts were involved, and a description of the design and method of construction in each case is given. The paper discusses the reasons for adopting a particular method of construction, and comments on problems encountered on each of the three contracts and the effectiveness of the various measures taken to overcome them. The particular difficulties of working under an operational airfield are detailed.

Jobling, DG Lyons, AC *Institution of Civil Engineers, Proceedings* Vol.  
60 No. t 1, May 1976, pp 191-218, 1 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

00 141112

**UTILIZATION OF HIGHWAY CONSTRUCTION  
SPECIFICATIONS AND TECHNIQUES FOR MASS  
TRANSPORTATION PROJECTS**

The paper describes the use of highway construction specifications and techniques for mass transportation projects in Connecticut. The Department of Transportation has undertaken several mass transportation projects. Two of the projects involving highway specifications were the construction of high level platforms at 22 locations along the Penn Central Railroad between New Haven and Greenwich and the people mover demonstration project at Bradley International Airport. Highway specifications were incorporated into these projects to varying degrees based on the nature of the project. This was done to maximize the use of time-tested specifications.

Select Committee Meeting Paper presented to the American Association of State Highway and Transportation Officials, 60th Annual Meeting, Proceedings, Detroit, Michigan, November 18-20, 1974.

Spaulding, JJ

American Assn of State Hwy and Transp Officials Conf Paper Nov. 1974,  
pp 32-43

ACKNOWLEDGMENT: EI

ORDER FROM: American Assn of State Hwy and Transp Officials 341  
National Press Building, Washington, D.C., 20004

00 141119

**TESTING OF SUBGRADE-STABILIZATION MOVES AHEAD**

One of at least five different fabrics which are available for stabilizing soft ground is discussed in this article. Monsanto's Bidim is a highly permeable fabric of continuous filament polyester fibers which has been installed for tests in railroad subgrades. Since ballast must be removed, test installations have been made in conjunction with track undercutting. Claims for fabrics are that they facilitate drainage, prevent fine soil from fouling subballast and spread heavy axle loads.

See related articles in no. 9, Sept. 1976, RRIS 00 141563. and no. 10, Oct. 1976, RRIS 00 142951.

*Railway Track and Structures* Vol. 72 No. 7, July 1976, pp 20-21, 3 Phot.

ORDER FROM: ESL

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00 141137

**RAILWAY TO THE ARCTIC RECONNAISSANCE AND RIGHT  
OF WAY CONSTRUCTION**

The construction of 1,200 miles of double track railway from Trout River to Prudhoe Bay, with a branch line to Inuvik, presents a gigantic undertaking. The need for such a railroad to be operational within a period of time which is acceptable in relation to the potential development of the Prudhoe Bay oil fields and the movement of that oil to market, will require the highest order of leadership, determination, and cooperation. However, from analysis, such a railway built according to present day standards is feasible, and at least single track operation should be possible within five years after the decision to commence design and route reconnaissance. The report summarizes a suggested approach to the construction of the "railway to the Arctic", including location surveys, subgrade construction, bridging, track-laying, and ballasting.

Charles, JL Lake, RW Corneil, ER Pearce, WG Law, CE Boon,  
C Mackay, NAM Roney, MD  
Canadian Institute of Guided Ground Transport No. 73-8, July 1973, 41  
pp, Figs., 4 Ref., 9 App.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

00 141250

**LATERAL SUPPORT SYSTEMS AND UNDERPINNING.  
VOLUME 1: DESIGN AND CONSTRUCTION**

This volume is a convenient reference on the design and construction of lateral support systems and underpinning which are often required in conjunction with cut-and-cover or soft ground tunneling. The design recommendations and construction methods described herein are a summary of the more detailed information presented in the companion volumes of this study. Included in this volume are discussions of displacements, lateral earth pressure, ground water, passive resistance, stability analysis, bearing capacity, soldier piles, steel sheeting, diaphragm walls, bracing, tiebacks, underpinning, grouting, and freezing. An overview compares the relative costs of the construction methods used in lateral support systems and underpinning. Other reports developed from the study are FHWA-RD-75-129, Volume II, Design Fundamentals; FHWA-RD-75-130, Volume III, Construction Methods; and FHWA-RD-75-131, Concepts for Improved Lateral Support Systems.

Also available in set of 3 reports as PB-257209-SET; also See Volume II, RRIS 00 139701 and Volume III, RRIS 00 139713.

Goldberg, DT Jaworski, WE Gordon, MD  
Goldberg-Zoino and Associates, Incorporated, (1363-Vol-1) Final Rpt.  
FHWA-RD-75-128, Apr. 1976, 327 pp, 145 Fig., 19 Tab., Refs.  
RESPONSIBLE INDIVIDUAL: Sallberg, JR (HRS-11)

Contract DOT-FH-11-8499

ACKNOWLEDGMENT:  
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PB-257210/5ST, DOTL NTIS

00 141418

**REMOTE SEISMIC DETECTION BY LASER INTERFEROMETER  
FOR MINING GEOPHYSICS AND TUNNELING OPERATIONS**

A modified laser interferometer system is developed that makes possible the noncontact detection and analysis of dynamic displacement on remote, unprepared rock surfaces. The system is a broadband device and does not suffer from acoustic-impedance-matching problems or frequency-response problems characteristic of conventional contact transducers. The potential applications of such a system include hazard detection in mines seeing ahead of a working face in tunneling operations, vibration-mode studies of large structures, and examination of vibrating surfaces in hostile environments.

Presented at a symposium at the 54th Annual Meeting of the TRB held in Washington, D.C.

Fitzpatrick, GL Bruce, RA (Denver Mining Research Center) *Transportation Research Record* Conf Paper No. 581, 1976, pp 11-24, 7 Fig., 5 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

00 141441

**EFFECT OF THE DEFLECTION OF AUXILIARY BEARINGS ON  
THE CONSTRUCTION OF REINFORCED CONCRETE  
VIADUCTS WHEN THEY ARE RAISED FOR LINE  
ELECTRIFICATION PURPOSES [Wplyw odkształcen konstrukcji  
pomocniczej na wiadukty żelbetowe w czasie podnoszenia]  
No Abstract. [Polish]**

Muczko, A *Przegląd Kolejowy Drogowy* Vol. 23 No. 3, Mar. 1976, pp 19-29, 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Wydawnictwa Czasopism Technicznych Ul Kazimierzowska 52, Warsaw 12, Poland

00 141507

**SEIKAN TUNNELLERS FACE BAD GROUND**

The author describes some of the problems encountered in constructing the Seikan undersea railway tunnel in Japan. Three tunnels are being built, the main tunnel, a pilot tunnel and a service tunnel. Setbacks have been caused by the geology of the seabed, a mixture of igneous rocks, tuff and mudstone. High water pressures have resulted in falls and very high rates of water ingress, the latest problem occurring when water burst into the workings and flooded sections of the three tunnels. Extensive grouting has been carried out to control inflow and new boring methods are being evolved to try and

combat the problems of water laden strata. Experiments are also being tried with a diventip type electro drill and double pipe boring using a casing pipe. /TRRL/

Gosney, J *Contract Journal* Vol. 270 No. 5047, May 1976, p 21, 2 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220717)

ORDER FROM: IPC Building and Contract Journals, Limited Surrey House, Throwley Way, Sutton, Surrey, England

00 141563

**TESTING OF SUBGRADE STABILIZATION FABRICS MOVES  
AHEAD-2**

This is the second in a series of articles dealing with fabric for stabilizing soft roadbeds. Mirafi 140 is a nonwoven material composed of man-made fibers randomly laid into a continuous web and fuse bonded. In railroad applications Mirafi is engineered for use over soft subgrades. It can serve to separate ballast from subgrade, as a filter preventing the migration of moist soil fines into ballast and as a tensile reinforcement which also confines ballast by frictional resistance at the ballast/subgrade interface.

See related articles in no. 7, July 1976, RRIS 00 141119, and no. 10, Oct. 1976, RRIS 00 142951.

*Railway Track and Structures* Vol. 72 No. 9, Sept. 1976, pp 32-34, 5 Phot.

ORDER FROM: ESL

DOTL JC

00 141568

**STRUCTURAL DESIGN OF GERMANY'S FIRST 250 KM/H LINE**  
German Federal Railway is undertaking construction of its first new high speed line between Mannheim and Stuttgart as part of its 1970 Development Program. Along with improving the competitive position of rail in West Germany, the new line is an important link in several international arteries for both fast passenger and fast freight trains. Standardized industrial construction is being used where it is at all possible. About 25 percent of the route will be in tunnels and 8 percent on bridges, but only in exceptional cases will individual designs be used for either. The standardized structures are described. Concrete ties and ballasted track will be standard throughout, but consideration is still being given to use of nonconventional track at later stages, primarily in tunnels and on bridges.

Bubel, H (German Federal Railway) *Railway Gazette International* Vol. 132 No. 8, Aug. 1976, pp 289-292, 3 Fig., 2 Tab.

ORDER FROM: ESL

DOTL JC

00 141688

**CONTRACTOR SAVES TIME AND MONEY WITH PLASTIC  
FABRIC ON RAIL RELOCATION JOB**

Construction of a temporary track to carry the West Shore route over New York State Route 15 while a full grade separation is constructed has involved the use of plastic support and filter fabric in place of granular materials on the subgrade. The 6500-ft detour is on the same alignment as the old railroad drainage ditch. On the 3-ft graded sub-base layer, a 25-ft wide covering consisting of two rolls of the fabric with a 3-ft overlap has been installed. The plastic filter acts as a support membrane to improve the bearing capability of the soil underneath, preventing the mixing of the aggregate and subsoil while promoting drainage of both. The plastic is topped with a 12-in. layer of ballast to which a further 8-in. layer is added after the track is laid.

*Constructioner* Sept. 1976, pp 28-29, 8 Phot.

ORDER FROM: Reports Corporation 1 Bond Street, Chatham, New Jersey, 07928

00 142076

**UNDERSTANDING GROUND MOVEMENTS CAUSED BY  
TUNNELLING**

This paper is a short progress report on studies of ground movements where model tests in the laboratory have been related to ground movement surveys on tunnel schemes with different ground conditions and excavation techniques. The suitability of several theoretical and empirical prediction techniques is examined. Results from model tunnel tests show good

prospects and similar tests are being used to check the validity of numerical solutions for the displacement field and final collapse parameters. Results from site measurements discussed include those made during construction of Moorfields Station Liverpool, the Fleet line at Green Park and Regent's Park London and several other sites including Chalk at Chinnor, Oxfordshire. Retrospective calculations have shown that numerical methods, given correct characteristics of ground properties, can produce accurate results. However because ground properties cannot be accurately defined before tunnelling, no true predictive method exists. The authors suggest that development of a combined theoretical/empirical approach will provide a solution. /TRRL/

Hudson, JA (Transport and Road Research Laboratory); Attewell, PB (Durham University, England); Atkinson, JH (Cambridge University, England); O'Reilly, MP (Transport and Road Research Laboratory) *Ground Engineering* Vol. 9 No. 3, Apr. 1976, pp 47-50, 6 Fig., 2 Tab., 20 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-221071)

**00 142246**  
**DYNAMIC PROPERTIES OF ALLUVIAL CLAY FOR ASEISMIC DESIGN OF TOKYO CENTRAL UNDERGROUND STATION**

The aseismic design for the Tokyo underground station structure, which is newly constructed in the weak ground, has been carried out in order to reduce the damage due to earthquakes. Dynamic moduli and damping ratios of soil which are required in the aseismic design have been measured by the vibrational triaxial compression test apparatus.

Nasu, M  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 1-5, 13 Fig., 3 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

**00 142251**  
**DYNAMIC RESPONSE OF ELASTICALLY SUPPORTED GIRDER TO THE PASSAGE OF TRAIN**

To reduce the ground vibration produced by passage of high-speed trains, the use of elastic support for bridge girders has been proposed. A method of analysis for dynamic response of such girders under passage of Shin Kansen trains has been developed. Response is much affected by the elasticity of the support. Further study of the running safety of the trains, strength of the rail at the girder ends, and of the stability of the girder during earthquakes must be investigated.

Matsuura, A  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 33-34, 4 Fig.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

**00 142268**  
**CONSTRUCTION OF JNR'S LARGE AUTOMATED MUSASHINO MARSHALLING YARD ON SOFT GROUND**

Technical problems encountered in construction of Musashino yard and methods of planning and designing of structures on soft foundation are discussed.

Okabe, T (Japanese National Railways) *Civil Engineering in Japan* Vol. 14 1975, pp 65-79

ACKNOWLEDGMENT: EI  
ORDER FROM: Japan Society of Civil Engineers 1-chome, Yotsuya, Shinjuku-ku, Tokyo 160, Japan

**00 142283**  
**FATIGUE AND FRACTURE OF BRIDGE STEELS**

A basis for fracture safe bridge design is examined. The relative roles that fatigue and fracture play in overall bridge design are examined from a fracture mechanics viewpoint. The methods available for measuring the

fracture toughness of bridge steels are indicated with their potential as quality control tests for adequate steel toughness examined. It is generally concluded that current steels provide adequate fracture toughness in most design situations.

Roberts, R Irwin, G *ASCE Journal of the Structural Division* Vol. 102 No. ST. 2, Feb. 1976, pp 337-353

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**00 142286**  
**TOWARDS BETTER BRIDGES FOR BETTER RAILWAYS (THE WORK OF THE BRIDGES SUB-COMMITTEE OF THE UIC)**  
No Abstract.

Spindel, JE *Rail International* Vol. 7 No. 9, Sept. 1976, pp 497-501, 13 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: ESL

DOTL JC

**00 142316**  
**IMMERSED-TUBE TUNNELS**

Some factors involved in the design and construction of the two forms of immersed-tube tunnels, steel shell and concrete box, are described. Among the points discussed are fabrication of steel and concrete shells, handling, sinking and jointing, loading and design, and applications.

Culverwell, DR *Tunnels and Tunnelling* Vol. 8 N Mar. 1976, 7 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**00 142529**  
**BITUMINOUS CONGLOMERATE AS A NEW SOLUTION FOR THE UNDER-BALLAST LAYER ON RAILWAY LINES: SCALING WITH A DYNAMIC METHOD**

The resistance to fatigue, the property of self-repair, the impermeability and resistance to freezing are the main characteristics which induced the introduction of bituminous conglomerate in the 1st and 4th sections of the new direct line, Rome-Florence, as an alternative to "sub-ballast" in cement mixture. The thickness of the stratum was determined, in addition to the CBR method, by a special procedure of calculation which takes account of the dynamic modules of the materials and which can be verified in situ. [Italian]

Celard, B *Ingegneria Ferroviaria* Vol. 31 No. 4, Apr. 1976, pp 3-11

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**00 142530**  
**BRIDGE FAILURES**

The most common causes of bridge failure are indicated in a classified table of actual examples. The most significant failures are described in some detail and the paper finishes with general discussion of the causes and some salutary remarks on bridge design philosophy which could be heeded by engineers practicing in all fields.

Smith, DW *Institution of Civil Engineers, Proceedings* Vol. 60 No. 1, Aug. 1976, pp 367-382

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**00 142936**  
**WASHINGTON METRO: OUR NATIONAL MODEL**

The first segment of Washington, D.C.'s rapid transit railway is now open. It has helped open federal eyes to the underlying cause of cost overruns--contract terms. The 96-mi (155-km) overall system features a host of engineering innovations, and these are the main focal points. Featured are aerial structures, tunneling, stations, system operation, and materials.

O'Neil, RS Fairhead, EA *ASCE Civil Engineering* Sept. 1976, pp 70-76

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

00 142951

**TESTING OF SUBGRADE STABILIZATION FABRICS MOVES AHEAD--3**

This installment describes a stabilization fabric, Typar, which is a nonwoven sheet formed of continuous filaments of 100 percent polypropylene that are directionalized preferentially in the length and width directions of the sheet and spunbonded at filament junctions. Typar is inserted between ballast and subgrade where it facilitates drainage by allowing water to move upward while filtering out fines which would foul ballast. It is also able to spread the load through the subgrade. This support membrane has been used under two miles of Illinois Central Gulf mainline and for a temporary shoe-fly track in New York State for an overpass project. Details of installation are given.

See related articles in nos. 7 and 9, RRIS 00 141119 and 141563.

*Railway Track and Structures* Vol. 72 No. 10, Oct. 1976, pp 22-23, 3 Phot.

ORDER FROM: ESL

DOTL JC

00 143089

**IMPROVING UNDERGROUND EXCAVATION THROUGH THE APPLICATION OF HYDRAULIC WATER JET ASSISTED MECHANICAL TUNNEL BORING**

Field tests were conducted in a granite quarry near Skykomish, Washington, to verify the concept of improving tunneling rates with water jet assisted mechanical cutting. Three different jet patterns were investigated, with only the configuration of jets between cutters being successful. Machine torque requirements were reduced approximately 25 percent when the water jets were used due to reduced cutterhead friction in the presence of the water. A comprehensive economic analysis was undertaken to determine the degree of cost benefits attainable from increased advance rates. Significant savings were seen to be possible depending on the percentage improvement assumed. Two complementary studies for insuring the rapid development and application of the technology are suggested: a laboratory optimization study and a field implementation program. The laboratory study should produce design parameters which take advantage of the two systems and the interaction between the two. The field implementation of water jet assisted tunneling should reveal the capabilities and benefits of the system and indicate any system design modifications required based on field experience.

Wang, F Robbins, R Olson, J  
Colorado School of Mines, National Science Foundation, Bureau of Mines  
NSF/RA-760092, Feb. 1976, 184 pp

ACKNOWLEDGMENT: NTIS  
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PB-254616/6ST, DOTL NTIS

00 143092

**PROCEEDINGS OF THE WORKSHOP ON THE APPLICATION OF HIGH PRESSURE WATER JET CUTTING TECHNOLOGY, HELD AT ROLLA, MISSOURI, ON NOVEMBER 10-11, 1975**

These proceedings describe the workshop held at the University of Missouri-Rolla, on the subject of water jet cutting. The underlying purposes of the workshop were twofold: (1) to bring together the leading investigators in order that they may meet, delineate the state-of-the-art, and exchange ideas for future development; (2) to indicate the strengths and weaknesses of the water jet system, to point out areas where the differing available systems are each most effective, and to suggest areas for future research. Panel discussions were held on the following topics: (1) Jet Application to Coal Mining; (2) Jet Application in the Cutting of Rock, Soil, and Concrete; and (3) Other Applications and Theoretical Considerations.

Summers, DA Bushnell, DJ  
Missouri University, Rolla, National Science Foundation NSF/  
RA-760115, 1975, 472 pp

Grant NSF-APR76-00738

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254316/3ST, DOTL NTIS

00 143096

**SOIL STABILIZATION (A BIBLIOGRAPHY WITH ABSTRACTS)**  
Soil stabilization methods and materials are reviewed in the citations. Pavement bases, beach sands, highway slopes, and foundation stabilization are investigated.

Supersedes PS-75470.

Habercom, GEJ  
National Technical Information Service Biblio. July 1976, 221 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PS-760588/4ST, DOTL NTIS

00 143205

**FRAME SYSTEM**

This report presents the results of a four-year project to provide bridge designers with a unified structural analysis tool for plane rectangular frames made up of prismatic and/or non-prismatic members. The program developed will calculate and report section, member and frame properties, fixed end moments, distributed moment and shear ordinates, and deflections for each member. Sidesway can be considered in single story frames. The program accepts prestressed cable information and produces cable path ordinates, cable path eccentricities, force coefficients, moment coefficients, shortening fixed end moments, prestress force, concrete strength, prestress moments and stresses, combined moments and stresses, and prestress deflections. Moment and shear plots may be obtained as optional output. Provision for describing railroad loadings or special overload truck loadings for live load analysis is also available with this program. A separate program provides input data retention and editing capabilities for this system.

Steele, RJ  
California Department of Transportation, Federal Highway  
Administration, (HPR) Final Rpt. CA-DOT-DS-41511752,  
FHWA/RD-76-S0508, June 1975, 160 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-256286/6ST, DOTL NTIS

00 143228

**ASSESSMENT OF DISRUPTIVE EFFECTS ASSOCIATED WITH URBAN TRANSPORTATION TUNNEL CONSTRUCTION. FINAL REPORT**

Social, economic, and environmental impacts resulting from tunnels' being constructed for mass transportation purposes in urban areas are identified. A matrix is constructed identifying the locus of costs to affected groups by four kinds of causal agents: traffic interference, property takings, environmental disturbances, and utility disruptions. A separate matrix must be constructed for social, economic, and environmental costs. The cells of the matrix must be further expanded in order to pinpoint actual costs: variables must be identified for each affected group and each causal agent and measures for the variables determined. The measurement and aggregation of impacts are discussed. Four possible ways of lessening impacts are mentioned.

See also RRIS 00A 058470.

Wolff, PC Scholnick, PH  
ABT Associates, Incorporated, Transportation Systems Center, Urban  
Mass Transportation Administration AAI-76-27, DOT-TSC-UM-  
TA-76-12, June 1976, 200 pp

Contract DOT-TSC-1018

ACKNOWLEDGMENT: NTIS, UMTA  
ORDER FROM: NTIS

PB-256848/3ST, DOTL NTIS

00 143229

**CUT-AND-COVER TUNNELING. VOLUME 1. CONSTRUCTION METHODS, DESIGN, AND ACTIVITY VARIATIONS**

This report presents the results of a study to develop an analytical method for evaluating and optimizing cut-and-cover tunneling operations. The



method is based on the results of a series of multiple estimates prepared by contractor type of basic resource estimating, rather than published unit prices. Major variables are type of structure, type of ground support, type of bracing, depth of excavation, and depth of water table. Volume 1 contains detailed descriptions of the study situations considered, the methodology to be employed, design criteria used, alternate methods of performing each construction activity, and a discussion on methods of cost analysis.

Wickham, GE Tiedemann, HR  
Jacobs Associates, Federal Highway Administration Final Rpt. JA-135,  
FHWA/RD-76-28, May 1976, 213 pp

Contract DOT-FH-11-8513

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257014/1ST, DOTL NTIS

00 143259

#### BRIDGE DEPARTMENT EDP DEVELOPMENT

This report presents the results of an eight-year project of EDP development in subjects of interest to the Bridge Department. The project yielded a substantial collection of usable EDP applications. They emphasize structural analysis and other bridge engineering processes. They also include a variety of management and administrative applications. The report describes project organization and performance, and discusses the resulting applications. Application abstracts are included.

Alves, FR  
California Department of Transportation, Federal Highway Administration Final Rpt. CA-HWY-BD-71032739, FHWA/RD-S0509, June 1973,  
66 pp

HP&R

ACKNOWLEDGMENT: NTIS  
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PB-256333/6ST, DOTL NTIS

00 143269

#### LATERAL SUPPORT SYSTEMS AND UNDERPRINING. 3 VOLUMES

No Abstract.

Set includes PB-257210 thru PB-257212. See RRIS 00

Goldberg-Zoino and Associates, Incorporated, Federal Highway Administration, (1363) Final Rpt. FHWA/RD-75-129, FCP 35B, Apr. 1976, 1059 pp, Figs., Tabs., Refs.

Contract DOT-FH-11-8599

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-2578209-SET/ST, DOTL NTIS

00 143732

#### STATE-OF-THE-ART REVIEW ON SHOTCRETE

This report contains the results of four studies pertaining to shotcrete technology. The first part of the report is an overview of American practices in shotcrete. The second part is a discussion of the development and practice of shotcrete technology in Europe, including a description of the New Austrian Tunneling Method (NATM). The third part describes the experiences of the U. S. Bureau of Reclamation in using shotcrete for tunnel linings and their design and construction concepts. The final part of the report is a discussion of instrumentation currently employed for obtaining the data used in design of shotcreted tunnels being constructed by the NATM. The NATM involves the use of the theoretical-observational approach to design. Each part of the report also gives recommendations as to needed research requirements and suggestions pertaining to possible extended uses of shotcrete in this country.

Prepared in cooperation with Massachusetts Inst. of Tech., Cambridge Contract DACA39-75-M-0082, and Mathews (A. A.), Inc., Rockville, Md.

Brekke, TL Einstein, HH Mason, RE  
California University, Berkeley, Waterways Experiment Station,  
Massachusetts Institute of Technology, Mathews (A.A.), Incorporated  
Final Rpt. WES-CR-S-76-4, June 1976, 122 pp

Contract DACA39-74-M-0371

ACKNOWLEDGMENT: NTIS  
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AD-A028031/3ST, DOTL NTIS

00 144061

#### BUILDING UNDERNEATH RAILWAY INSTALLATIONS [Unterbauung von Bahnanlagen]

The author takes the example of Essen's Central Station and shows how it is possible to gain precious space for passenger service installations when expanding or rebuilding stations. He describes the type of buildings possible and their location underneath railway installations. He also explains the advantages of this type of solution in urban areas and makes suggestions about architectural aspects. [German]

Tschiesche, W *Eisenbahntechnische Rundschau* Vol. 25 No. 6, June 1976,  
pp 347-356, 6 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

00 145558

#### A REPORT ON THE PRACTICE OF CHEMICAL STABILIZATION AROUND SOFT GROUND TUNNELS IN ENGLAND AND EUROPE-OBSERVATIONS MADE DURING A THREE WEEK TRIP

Over the period August 26, 1975, to September 13, 1975, Dr. G. W. Clough visited England, France, and Germany to discuss and observe chemical stabilization projects being performed in conjunction with soft ground tunneling. This visit was sponsored by the U.S. DOT through the Research Contract No. OS-50123 for which Dr. Clough is the principal investigator. The research program involves a general study of the technique of chemical stabilization around soft ground tunnels.

(PC A06/MF A01)

Clough, GW  
Stanford University, Department of Transportation DOT/TST-76/92,  
115 pp

Contract DOT-OS-50123

ACKNOWLEDGMENT: NTIS  
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PB-259291/3ST, DOTL NTIS

00 145614

#### TUNNEL DESIGN CONSIDERATIONS: ANALYSIS OF STRESSES AND DEFORMATIONS AROUND ADVANCING TUNNELS

A truly comprehensive analysis of any ground-tunnel liner interaction problem requires that the three-dimensional nature (geometry, stress and displacement fields) of the problem be considered. This report describes an investigation undertaken to study the complex distribution of stresses and displacements mobilized around and along unlined, partially lined, and completely lined tunnels being advanced through soils of various stress-strain behaviors. Circular tunnels with a depth to diameter ratio of five were considered. The unlined and lined tunnel analyses were divided into three subgroups on the basis of the simulated stress-strain behavior of the soil. One series of analyses considered linear-elastic behavior and involved the consideration of two different elastic modulus values and three different Poisson's ratio values. The soil in a second subgroup was assumed to exhibit elasto-plastic behavior corresponding to a shear strength independent of the mean stress and the angle of shearing resistance. An additional series of elasto-plastic analyses considered soil behavior to be a function of both cohesion and the angle of shearing resistance. The finite element program GEOSYS was used in this investigation. The excavation and construction options of this computer program made it possible to simulate, with a minimum of effort, a tunnel being advanced through an initially stressed ground mass.

See also PB-240216.

Ranken, RE Ghaboussi, J  
Illinois University, Urbana, Federal Railroad Administration Final Rpt.  
UILU-ENG-75-2016, FRA/ORD-75-84, Aug. 1975, 164 pp

Contract DOT-FR-30022



ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-258587/5ST, DOTL NTIS

00 146169

#### FROST INFLUENCE ON THE STABILITY OF RAILROADS

[Influence du gel sur la stabilité des voies ferrées]

Contents: Definitions and enumeration of the dangers which threaten the roads: (Disruption of the balance or instability of the superstructure or the understructure in its entirety; Frost action; The insufficiency of the road bearing capacity); Geological study and prospecting of the area for the projected road; (Frost sensibility; Bearing capacity; soil plasticity and liquidity limit-hydrological conditions on and around the prospected road; Depth reached by frost); Dimensioning on road foundations. [French]

Trans. of Bulletin Technique de la Suisse Romande, v84 n11 p193-199, 24 May 58.

Bonnard, D Desponds, R Recordon, E  
Cold Regions Research and Engineering Laboratory 1960, 17 pp

ACKNOWLEDGMENT: NTIS  
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AD-874904/6ST, DOTL NTIS

00 147593

#### C&NW ATTACKS THE TOUGH SPOTS

The production use of a ballast undercutter/cleaner on the Chicago and North Western and the machine's use in conjunction with the installation of a stabilizer fabric between the ballast section and subgrade where it is difficult to keep water away from the track is discussed. C&NW used Mirafi 140, made of two types of continuous filament fibers--one wholly polypropylene and the other a polypropylene core covered with a nylon sheath. This sheath acts to filter fine soil particles from contaminating material above the material and to support the track on the subgrade.

*Progressive Railroading* Vol. 19 No. 10, Oct. 1976, pp 47-48, 5 Phot.

ORDER FROM: Murphy-Richter Publishing Company 20 North Wacker Drive, Chicago, Illinois, 60606

DOTL JC

00 147682

#### DESPERATE NEED TO SLASH CONSTRUCTION COSTS OF NEW SUBWAYS

Subways and subway stations cost far too much to build in the U.S. Whereas Londoners recently built 3-1/2 miles of subways and subway stations for only \$18 million, the Washington Metro is running \$50 to 60 million/mile. With costs like this, the U.S. simply cannot afford to build many miles of subways. Among ways to dramatically cut costs: (1) establish better contracting practices--e.g. having the consultant do a more thorough geotechnical investigation so subway contractors won't have to put large contingencies factors in their bids; (2) introduce new technologies such as slurry walls, secant pile walls, and precast concrete liners; (3) Remove the burden of risk from the shoulders of consultants, risks connected with the introduction of new technology; (4) More carefully study alternatives in the initial planning phases of a subway system--e.g. necessary for subway tunnels to be so large? Subway platforms need to be that long? Do stations have to be as large or as deep? Too much over-design? In sum: the U.S. DOT is unhappy with the designs of current subway systems; they are not as cost-effective as they could be. The U.S. must introduce technical and institutional innovations, as other countries have done, if costs are to be sharply reduced.

Dallaire, G *ASCE Civil Engineering* Vol. 46 No. 12, Dec. 1976, pp 37, 6 Fig., 3 Phot.

ACKNOWLEDGMENT: ASCE Civil Engineering  
ORDER FROM: ESL

DOTL JC

00 147821

#### THE USE OF PLASTICS IN FORMATION AND TUNNEL WORK ON THE DB

After a brief review of plastics used in building work, the author describes the application of various plastics products in earth, formation and tunnel works on the DB. In earth and formation work these include PVC drain

pipng and sheeting, rigid foam boarding and fleece mats; in tunnel construction, various sheetings and seals of synthetic rubber. Not all these products have so far given convincing results. [German]

Martinek, K *Eisenbahntechnische Rundschau* Vol. 25 No. 9, Sept. 1976, pp 543

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

00 147822

#### CHEMICAL CONTROL OF BRUSHWOOD

The necessity for scrub control on railway property is discussed, together with the problems of existing methods of treatment. The objectives of a practical and effective method of brushwood control are examined, and the service available to the railway engineer is described in this context.

Castell, JA *Permanent Way Institution, Journal & Rpt of Proc* Vol. 94 No. t2, 1976, pp 105-109

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Derry and Sons, Limited Canal Street, Nottingham, England  
DOTL JC

00 147836

#### AN EXAMINATION OF INTERACTIVE COMPUTER USAGE IN STRUCTURAL DESIGN WITH SPECIAL REFERENCE TO BRIDGES

Recent developments in computer technology have enabled an abundant supply of relatively cheap computing power to be available, and in the past few years the ability of engineers to use computers has increased considerably. However, usage is still largely restricted to analysis and little effort has been aimed at integrating computers more fully into design processes. Interactive computing, with an engineer personally directing operations, offers an effective way in which this could be achieved. Chores of calculation and data handling are undertaken by the computer; decisions requiring judgement and experience are made an engineer. This approach can be adopted with a wide of available equipment, but an office based mini-computer with visual display is shown to be capable of effectively handling problems of considerably complexity.

Cope, RJ Bungey, JH *Institution of Civil Engineers, Proceedings* Vol. 61 No. T2, Sept. 1976, pp 525-38

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

00 147898

#### TESTING OF SUBGRADE STABILIZATION FABRICS MOVES AHEAD-4

The "soft" condition of an industrial track leading into a plant was solved by using a nonwoven polypropylene cloth that can be fabricated to specified dimensions in the shop or joined at the job site. This Polyfelt TS300 aids in stabilization by its quality of elongating under stress by 120% before rupturing. The material has both vertical and horizontal permeability but filters out fines that would otherwise be carried up to the ballast. Installation procedures are described.

See other articles in series: RRIS 00 141119, 141563 and 142951.

*Railway Track and Structures* Vol. 72 No. 12, Dec. 1976, pp 18-19, 3 Phot.

ORDER FROM: ESL

DOTL JC

00 148303

#### ROLE OF FILL STRENGTH IN THE STABILITY OF EMBANKMENTS ON SOFT CLAY FOUNDATIONS

This investigation was performed to study the role of fill strength in the stability of embankments. It covered four areas: methods of stability analysis of embankments on soft foundations, effects of progressive failure on the stability of embankments on soft foundations, the development of cracks in embankments and their effect on stability, and a preliminary study of the effectiveness of steel reinforcing in prevention of cracking in embankments on soft foundations.

Chirapuntu, S (California University, Berkeley)  
Waterways Experiment Station Contract Rpt. S-76-6, June 1976, 231 pp,  
44 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**00 263026**  
**CUT-AND-COVER TUNNELING TECHNIQUES. VOLUME 2.**  
**APPENDIX**

This study of cut-and-cover tunneling techniques in urban areas considers environmental quality, geotechnical investigation and analysis, ground support, ground water control, permanent structure, restoration, cost

considerations and major problems. Both United States and Foreign techniques are reviewed. This volume consists of summaries of recent noise-control legislation, and the Ontario, Canada, expropriations act. /FHWA/

Sverdrup and Parcel and Associates, Incorporated Final Rpt.  
FHWA-RD-73- 41, Feb. 1973, 175 pp, Apps.  
RESPONSIBLE INDIVIDUAL: Sallberg, JR (HRS-11)

Contract DOT-FH-11-7803

ACKNOWLEDGMENT: Federal Highway Administration, NTIS  
ORDER FROM: NTIS Repr. PC, Microfiche

PB-222998

01 052871

**STRESSES IN THE RAILS, IN THE BALLAST AND IN THE FORMATION RESULTING FROM TRAFFIC LOADS. TRACK MEASUREMENTS OF STRESSES IN RAIL FASTENINGS**

Interim Report No. 3, prepared by the D 71 Committee, gave the results of a series of laboratory tests carried out on several types of German, British and French fastening. The present report gives the results of field measurements taken using the same types of fastening. Measurements of the British fastenings were limited to ascertaining the transverse stiffness (section 2). Three particular features were measured: 1) measurements of the gauge widening of the unloaded track due to a given horizontal force pressing the two rails apart; 2) measurements of the forces exerted by the wheel of a vehicle on the rail; 3) measurements of the variation of the holding-down force of the coachscrews with passing trains.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D71/RP 6/E, June 1967, 24 pp, Figs., Tabs.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 052886

**OPTIMUM ADAPTATION OF THE CONVENTIONAL TRACK TO FUTURE TRAFFIC. DESCRIPTION OF THE RESEARCH METHODS. DEFINITIONS**

This report is devoted essentially to the definition of a plan of work enabling the optimum adaptation of conventional track to future traffic (heavy axle loads and high speeds) to be obtained. Having described the general concepts and the definitions useful for the pursuit of the study, the plan of work which follows two principal research paths is evolved: tests with predetermined loads and field tests under actual traffic loads; associated work, such as the determination of the rheological properties of the track and the study of ballast performance in the laboratory, is also envisaged and explained. Test areas and certain methods of measurement are described in the Appendices.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D117/RP 1/E, Oct. 1971, 53 pp, 9 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 052887

**QUALITY OF RAILS AND MEANS OF GUARANTEEING IT. FALLING WEIGHT TEST**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D45/RP 1/E, Mar. 1959, 39 pp, Figs., 2 Tab.

ACKNOWLEDGMENT: UIC  
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01 052888

**QUALITY OF RAILS AND MEANS OF GUARANTEEING IT. DEVELOPMENT OF A MECHANICAL DEVICE FOR RECORDING THE FLAW ECHOES SUPPLIED BY AN ULTRASONIC APPARATUS**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D45/RP 4/E, Mar. 1962, 16 pp, 13 App.

ACKNOWLEDGMENT: UIC  
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01 052889

**QUALITY OF RAILS AND MEANS OF GUARANTEEING IT. CHECKING OF THE ASYMMETRY OF THE RAIL PROFILE**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D45/RP 7/E, Mar. 1964, 8 pp, 1 Fig.

ACKNOWLEDGMENT: UIC  
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01 052890

**QUALITY OF RAILS AND MEANS OF GUARANTEEING IT. REVISION OF THE ALBUM OF SAMPLE SULPHUR PRINTS APPENDED TO UIC LEAFLET 860 FOR THE SUPPLY OF RAILS**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D45/RP 8/E, June 1966, 13 pp, 2 App.

ACKNOWLEDGMENT: UIC  
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01 052896

**STUDY OF RAIL FAILURES IN THE TRACK. GUARANTEE OF RAILS ACCORDING TO TONNAGE CARRIED**

At the request of the 7th Commission of the UIC the D 88 Committee of Experts has been charged with studying the possibility of defining a guarantee clause based on the tonnage carried by the rails removed prematurely, which would substitute the present clause on time. Five Administrations which have delegated experts to the D 88 Committee have supplied the information used in this study. The Committee have examined respectively the advantages and disadvantages of a guarantee based on time or on tonnage carried; they consider that because of the variations between different Administrations it is not possible immediately to abandon the present clause based on time. It would, however, not seem impossible to envisage a selective guarantee based upon a clause of time varying with the classification of line.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D88/RP 3/E, Oct. 1965, 10 pp, 6 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053096

**DETERMINATION OF THE MOST ECONOMIC WEIGHT OF RAILS. REPORT OF INQUIRY**

Conforming to the ORE Control Committee's request, the present Report does not aim at giving conclusions on the question, but simply an analysis of the various Administrations' opinions. In this aim, the present Report, based on the questionnaire, has been carried out as follows: Firstly, understanding the historic evolution of the weight of the rail in the different countries, so as to investigate whether this evolution presented common characteristics, and, to investigate the motives given by the different Administrations for justifying the trend of this evolution. Secondly, attention is directed on the sections of rails at present in use, the results obtained, and the improvements desired. In the whole of this study, it has appeared necessary to distinguish very clearly between the joint and the portion of rail outside the joint. This distinction, already necessary in the older types of track-laying, is still more so now, taking into account the tendency to use long-welded rails throughout when this is possible. Certain causes of weakness, linked to the weight of the rail, which manifest themselves particularly at the joint, disappear in fact in these new techniques, which may lead to modify the conclusions which are valid for the conventional type of track-laying. The technique being however only a means, of which the aim is the reduction of the working costs, we should

have desired to develop especially the study of the benefits obtained by the additional weight of rail, in comparing the increase of the equipment costs which derive from it, and, the economies which may be realized on the subsequent maintenance and renewal costs. The very small amount of data which we have received on this subject, does not allow comparisons to be made between the various Administrations, and, the study of this part has only allowed impressions to be given and not comparisons justified by concrete figures. Finally, in order to comply with the programme which has been outlined, we have sought to ascertain the opinions of the Administrations with regard to the effect of the weight of the rail on the behaviour of the rolling stock.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. D27/RP 1/E, Dec. 1957, 113 pp

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053097

**GUIDING PRINCIPLES FOR THE DESIGN OF POINTS AND CROSSINGS (UIC 54 AND UIC 60 RAIL PROFILES). ASYMMETRICAL SWITCH RAIL SECTION FOR THE UIC 60 RAIL. SUPPLEMENT TO THE FINAL REPORT NO. 6**

The report is a supplement to the recommendations given in Report D 72/RP 6. Shape and characteristic data are given for an asymmetrical switch rail section to fit the UIC 60 kg/m rail.

Restriction on the use of this document are contained in the explanatory material.

International Union of Railways D 72/RP 7/E, Oct. 1970, 6 pp, 1 Fig., 2 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053176

**NON-CONVENTIONAL TRACK. REPORT ON THE EXPERIMENTAL SLAB TRACK IN OELDE STATION. CONSTRUCTIONAL ARRANGEMENTS AND MEASUREMENTS**

This report describes installation of slab track at Oelde where there is opportunity of high speed running, and experience since the end of 1972. Two types of rail fasteners were used and the slab was laid on a styropor concrete bed providing thermal insulation and load distribution. Details of design are described and measurements reported showing strains and geometrical condition of the track.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D 87/RP 13/E, Oct. 1975, 29 pp, 142 Fig., 9 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053184

**BEHAVIOUR OF THE METAL OF RAILS AND WHEELS IN THE CONTACT ZONE. THREE-DIMENSIONAL PHOTO-ELASTIC STUDY OF A LOADED BUT NON-BENT RAIL**

The behaviour of the metal of rails depends, to a large extent, on the magnitude and the distribution of the stresses in the vicinity of the contact surface between rail and wheel. The C 53 Committee has thus been assigned, as its first objective, to determine the stresses produced by the strains applied to the rail (or to the wheel). These strains comprise in particular: a vertical force, representing the action of the loaded wheel on the rail (and inversely); the bending of the rail resting on the sleepers or, equivalently, on an elastic body; the plastic deformations produced in certain regions of the rail (or of the wheel); these produce residual stresses which superimpose themselves on those produced by the two first types of strains and on to those which may result from manufacture; the defects of the metal, which modify, in the vicinity of these, the stresses due to the preceding strains. Prof. Besseling and Dr. van Bommel plan to carry out these determinations mathematically,

while making extensive use of modern calculation means. Interim Report No. 1 gave a detailed description of their calculation method and of its justification. With the same objective in view, Mr. Teisser du Cros and Mr. Radenkovic are carrying out some tests on rail and wheel models, the materials constituting these models having mechanical properties similar to those of steel (elastic and plastic deformations). Some photo-elastic tests are being carried out in the Laboratory of the Rolling Stock and Motive Power Department of the SNCF at Levallois. The purpose of these tests is to determine, on a reduced scale model of rail, the stress-distribution due to the first type of strains. Knowledge of this distribution will facilitate the calculations of Prof. Besseling. Moreover, when the accumulated plastic deformations have produced a system of residual stresses, which, owing to the consecutive passages of a sufficiently large number of rolling loads, has reached a state of equilibrium, so that this system does not change any longer after each subsequent load passage, one should, in order to determine the resultant stresses produced in the rail in the neighbourhood of a load, super-impose on the preceding residual stresses, the purely elastic stresses due to the action of the load and the bending of the rail (strains a and b). Their determination is thus an absolute requirement and the experimental method based on photo-elasticity can be used; it completes the modern mathematical calculation methods.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. C53/RP 2/E, Oct. 1965, 15 pp, 25 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053185

**BEHAVIOUR OF THE METAL OF RAILS AND WHEELS IN THE CONTACT ZONE. COMPOSITION OF THE DIFFERENT STRESS CONDITIONS IN THE WHEEL/RAIL CONTACT ZONE. DEVELOPMENT OF A NEW FATIGUE CRITERION**

The first very brief part of this report contains some additional results concerning the residual stresses in the rail. The second part, which constitutes the more essential part of the study, deals with calculations on the composition of the residual stresses induced in the rail during the passage of a wheel, for a wheel, for different wheel-loads and diameters, transverse curvature radii of wheel-tyres, rail inertia, and track moduli. Some qualitative conclusions on the influence of these various parameters have been given in using an original fatigue criterion, the principles of which are also outlined in this report. This criterion should permit a quantitative analysis of the fatigue phenomena to be made when the results of the fatigue tests in progress are known.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways C53/RP 7/E, Apr. 1972, 63 pp, 42 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 057885

**ASSESSMENT OF DESIGN TOOLS AND CRITERIA FOR URBAN RAIL TRACK STRUCTURES. VOLUME II. AT-GRADE SLAB TRACK**

This report presents the results of a critical review of the technical factors which govern the design and performance of at-grade slab track for urban rail systems. The assessment of current design practices is based on a review of the literature and discussions with experienced track design personnel. The evaluation includes descriptions of slab structures now in use in four countries, followed by review of design and analysis procedures used to characterize the subgrade and its support characteristics; the reinforced concrete slab itself, and the subgrade-support system. With a few exceptions, most of the work reported in the literature is based on highway or runway applications, where the mechanism of load transfer into the slab is completely different than in a rail support slab. Further research on the mechanisms of load transfer from rail fasteners into a reinforced concrete slab is needed, and the newly developed finite element approach appears well-suited.

See also Volume 1, PB-233016.

Meacham, HC Prause, RH Waddell, J  
Battelle Columbus Laboratories Final Rpt. Apr. 1974, 101p

Contract DOT-TSC-563

ACKNOWLEDGMENT: NTIS  
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PB-233017/3, DOTL NTIS

**01 094187**  
**DEVELOPMENT OF STANDARD SPECIFICATIONS FOR**  
**CONCRETE TIES FOR RAPID TRANSIT, PHASE I. TASKS 1 TO**  
**5**

This report presents the results of the first part of a project to develop specifications for standard concrete ties for rapid transit use. The report is presented in five sections: Section 1 estimates the market potential of concrete ties for the transit industry. Section 2 presents a technical and economic evaluation of concrete ties based on international experience. Section 3 presents parameters necessary for the design of standard concrete ties for rapid transit use. Section 4 covers the preliminary specifications for the materials, fabrication and handling of the standard concrete ties.

Hanna, AN Weber, J  
Construction Technology Laboratories, Transit Development  
Corporation, Incorporated Final Rpt. TDC-CT-75-1, Oct. 1975, 117 pp

ACKNOWLEDGMENT: NTIS  
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PB-247676/0ST, DOTL NTIS

**01 130190**  
**RAILROAD ENGINEER REFERENCE BOOK. VOLUME 1**  
**[Spravochnik inzhenera-puteitsa. Tom 1]**

This is the first volume of a two-volume reference set. It presents, on the basis of national and foreign experience, the most important reference data and materials on the construction, standards of organization and content of the railroad track, and the interaction of the track and rolling stock, as well as brief information on the rolling stock. The book is intended for railway engineers, builders, and designers of main railroads and industrial transport. Soviet railroads make up 10% of the earth's track but turn over 50% of its goods, determining their exceptionally high operational intensity, and the necessity of radical reconstruction, realized on the basis of electrification, the inculcation of new, progressive types of tension, more effective technical equipping of all branches of transport, the creation and application of leading organization technology, and the mechanization of labor for maintenance and repair. Chapters include (1) railroad transport management, (2) dimensions and conditions for transport of over-dimensioned cargoes, (3) subgrade, (4) artificial structures, (5) upper track structure, (6) overall track organization, (7) technical conditions and standards of organization and design of the upper track structure, (8) junctions and crossings of rail tracks, (9) interaction of track and rolling stock and track calculations, (10) rolling stock. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Transport Publishing House 1972, 768 pp, 369 Fig., 269 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmanyi Tupik, 6a, Moscow  
B-174, USSR

**01 130191**  
**RAILROAD ENGINEER REFERENCE BOOK. VOLUME 2**  
**[Spravochnik inzhenera-puteitsa. Tom 2]**

This is the second volume of a two-volume reference book for railway engineers. It presents important reference data and materials on the organization, technology, and mechanization of track work, fighting against snow, water, and sand, and the economics of planning railroad track management; it is intended for railway engineers, builders, and planners of the major railroads and of industrial transport. Chapters include (11) Track management system; (12) Current track repair: organization and planning, mechanization, control over condition of track, subgrade, upper structure, labor and material expenditure; (13) Protection of the track from snow-and sand-drifts: snow cleaners, snow-removal and snow-melting machines; (14) Track machines, mechanisms, tools: classification, hydraulic machines, measuring and control equipment; (15) Track repair work: subgrade capital

repairs, technical standards, network planning and management; (16) Insurance of train traffic safety during track work: protection of work production places on the stages, on the stations; (17) Safety technology on track work: general requirements, on electrified sections, on high-speed sections, loading-and-unloading work; (18) Repair of elements of the upper track structure: welding rails, electric arc welding, burnishing, smelting, wooden tires, concrete steel ties; (19) Economics, planning, financing, and calculation: individual values of track materials, book-keeping, definition of capital investment effectiveness, fundamental economic indices; and, finally, (20) Labor and salary: numbers of workers, labor law codes, work production, work remuneration and typical staff, and special clothing and protective devices. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Transport Publishing House 1972, 520 pp, 138 Fig., 150 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmanyi Tupik, 6a, Moscow  
B-174, USSR

**01 130193**  
**MODERN DESIGNS OF RAILROAD TRACK SUPERSTRUCTURE**  
**[Sovremennyye konstruktsii verkhnego stroeniia zheleznodorozhnogo puti]**

This publication presents types of contemporary designs for upper road structure of USSR railroads, and for each of its elements taken separately; it publishes data for the new government standards on materials of the upper structure and the renewed and newly constructed normative documentation on the arrangement and content of the track. Included are problems connected with the working out of principally new, prospective constructions of railroad track for sections with ultrahigh load stress and train traffic speeds, as well as the contemporary condition of the upper track structure of foreign railroads. The book is intended for road management technical engineering workers and railroad track builders, and may be found useful by students of the higher educational institutions, as well as of the technical schools. The chapters are (1) Typification of the upper track structure: operational characteristics of railroad track as an engineering construction, spheres of application of various designs, foreign types of structures; (2) Rails: contemporary designs, service lives, perfection of quality of rail steel, old rails and their repeated use; (3) Long rails and non-junction track: lengths, stability parameters, design of non-junction track with spike and terminal ties; (4) Interval rail ties: requirements, contemporary designs, vertical plane stability, horizontal stability; (5) Sleepers: concrete steel sleepers, wooden sleepers, sleeper management; (6) The ballast layer: construction of the ballast prism, contemporary ballast materials, vibrations, increase of carrying capacity of the ballast prism; (7) Concrete block foundations beneath-the-rail: sphere of application, design and construction; (8) Switching crossings; (9) Peculiarities of the upper track structure arrangements on fast lines; (10) Peculiarities of arrangements and operation of the upper track structure on high-load-stress lines. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Transport Publishing House 1975, 280 pp, 141 Fig., 80 Tab., 28 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmanyi Tupik, 6a, Moscow  
B-174, USSR

**01 130194**  
**PROBLEMS RELATED TO TRACK AND TRACK MAINTENANCE**  
**[Vaprosy puti i putevogo khoziaistva]**

This issue presents the following reports: (1) Loads, speeds, load stress, track operational experience of rolling stock abroad, tentative communications-long life of rails, long contact life of rails, long life of rail according to individual operational output, wood-tie outputs, cleansing and replenishment of the ballast layer, current track repair, composite indices. (2) Estimate of the dynamic influences of rolling stock during the calculation of the stability of railroad embankments; methodical indications for the calculation of dynamic effects of rolling stock at the time of computation of the stability of the subgrade slopes (embankments), experimental and theoretical calculation bases of "methodical indications", modeling the embankments in the presence of the dynamic effect of train loads, calculations of the reliability of the embankments, analysis and synthesis of the results of modeling and calculations. (3) Experimental analysis of several

design solutions on swamp subgrades. (4) The study of the work of electrical controllers during the investigation of destruction of maximum condition of embankment models. (5) Spheres for rational application of various road packers on the construction of railroads. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Institute of Engineers for Railroad Transportation Proceeding No. 443, 1973, 207 pp, 36 Fig., 36 Tab., 48 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

01 130195

#### ORGANIZATIONAL PROBLEMS OF TRACK MAINTENANCE

[Voprosy organizatsii putevogo khoziaistva]

This issue presents the following reports: (1) The influence of the length and type of repair upon labor expenditures for current maintenance of track, depending upon the volume of train traffic; (2) On establishing maintenance practices for extending the service of rail fastenings on jointed track; (3) On problems of utilizing traffic "windows" for current maintenance of track; (4) On specifying the transfer of shoulder base stresses to the shoulder stresses in the rail head; (5) On determining ballast density by radiotechnical methods; (6) The influence of unequal resilience in the subgrade and foundation on stress deformation of the track structure beneath the rail under static loads; (4) Research into oscillation of embankments on marshlands; (8) Protection of controllers from humidity during full-scale tensimeterization of rails. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Institute of Engineers for Railroad Transportation Proceeding No. 383, 1972, 151 pp, 41 Fig., 36 Tab., 52 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

01 130196

#### RESEARCH INTO NEW DESIGNS OF RAILROAD TRACK

[Issledovaniia novykh konstruktssii zheleznodorozhnogo puti]

This issue presents the following reports: (1) Geometrical imperfections of track with below-the-track foundations of reinforced concrete, and their influence upon the tractive condition of the rails; (2) Models of resiliency of various below-the-track foundations and their formation; (3) Stress-deformed condition of rails in track with reinforced concrete below-the-track foundations under train load. The influence of this structure upon the rolling stock; (4) Stresses from longitudinal forces in rail strings in the absence of a train load; (5) The securement of bolts in ties; (6) Toward the calculation of the necessary resiliency characteristic of spring elements of attachments in rail fastenings. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Institute of Engineers for Railroad Transportation Proceeding No. 382, 1972, 169 pp, 12 Fig., 68 Tab., 42 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

01 130197

#### INVESTIGATION INTO THE RESPONSE OF FASTENERS AND RAILS [Issledovanie raboty skreplenii i rel'sov]

This issue presents the following reports: (1) Some problems of investigation of increased resiliency rubber pads for a track with concrete ties. This shows calculation and design of increased resiliency rubber pads intended for decreasing rigidity of the track with concrete ties. Included are laboratory experiments, experimental research into the operation of rubber pads on the track, and operational observations. (2) Constructional advantages of glue-bolt insulating joints and effectiveness of application, showing an analysis of research on the stress deformed state of glue-bolt insulating joints under various types of loads. The results of observations on the operation of joints in the track, brief information about the technology for manufacture of the joints, and economic grounds for their application are also presented.

(3) The distribution of plastic deformation in the surface zone of rail rolling attachments, presenting the results of experimental research into the distribution of plastic deformation on the width and depth of the head of P65 standard production rails of the "Azovsteel" and "KMK" enterprises. It is determined that during the evaluation of the character of formation of the forged layer of the rail-heads it is necessary to include the load on the axle and the allowable tonnage (especially during the first operating stage) as well as the contact conditions of the rail wheels. (4) Experimental research into operation of railroad track in the early period of stabilization, presenting the results of experimental research on the peculiarities of operation of temporary railroad track. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Institute of Engineers for Railroad Transportation Proceeding No. 354, 1971, 121 pp, 44 Fig., 48 Tab., 51 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

01 130200

#### CALCULATIONS FOR THE VERTICAL DYNAMIC LOAD ON RAILROAD TRACK [Raschety zheleznodorozhnogo puti na vertikal'nuu dinamicheskuiu nagruzku]

This book presents the principal bases of the theory of simultaneous statistical oscillations of the track as a system with distributive parameters, and of the rail vehicle as a system with many degrees of freedom in the vertical plane. Accepted in the capacity of perturbations are irregularities on the track and the wheels, as well as clearances between the rail and the foundation. Algorithms are given for solving the differential equations of simultaneous vertical oscillations of various fundamental types of rolling stock and track, realized on the BESM-4 electronic computer, which can also be utilized for the solution of these tasks on the M-22 and M-222 independently of the mathematical ensuring of the specific type of machine. For a wider utilization of the various electronic computers during the dynamic calculation of the track a program is given which is also based on Fortran language and translated into the GE-400 electronic computer. New calculation methods and algorithms for solution allow to be exposed a series of new qualitative and quantitative particularities of the interaction of the vehicle and the track, especially during high traffic speeds. The book is intended for scientific and technical scientific workers of railroad transport. The chapters include (1) Task presentation. (2) Theoretical premises of calculation: mathematical model of the vehicle, equalization of the crew oscillations under the action of vertical forces applied in the wheel-rail contact, computation of the matrix of the spectral densities of irregularities, definition of average significances and mean squared deviations of basic parameters characterizing the stressed and deformed condition of the track; (3) Calculation characteristics: of rolling stock, track structures, spectral analysis of surface irregularities in the rolling of the car wheels; (4) Calculation program on the electronic computer of the interaction of the track and rolling stock under the action of vertical dynamic forces: short description, block schematic, makeup of output information; (5) Analysis of the results of mass calculations on the computer. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 502, 1973, 80 pp, 30 Fig., 16 Tab., 14 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

01 130201

#### TRACK AND SWITCH DESIGN IMPROVEMENT

[Sovershenstvovanie konstruktssii puti i strel'nykh perevodov]

This book presents the following reports: (1) New government standards for upper track structure elements; (2) Rails for especially load-stressed and fast lines; (3) Optimal correlation of the mechanical properties of the elements of the upper track structure; (4) New types of rail fastenings for concrete rail ties--fundamental characteristics; (5) The problem of vertical stability of rail fastenings; (6) New standards for ballast materials; (7) Asbestos ballast and its application--technical conditions and requirements; (8) The establishment of criteria of the durability of rail, steel and the choice of a method for

its definition; (9) The peculiarities of operation of the subgrade surface during the spring thawing of soil; (10) Analysis of the durability of the track, taking into account the intensity of its utilization; (11) Contemporary constructions of switches and their operation under rolling load; (12) New types of wooden squared switch ties and their operation during shunting; finally, (13) The principles of definition of the durability of the track taking into account the intensity of its utilization. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 501, 1973, 208 pp, 96 Fig., 41 Tab., 75 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

#### 01 130202

#### CONJUGATION OF CURVES AND PECULIARITIES OF ROLLING STOCK MOVEMENT ON THEM [Sopriazheniia krivykh i osobennosti dvizheniia podvizhnogo sostava po nim]

This book reports results of research on the characteristics of vehicles and response of the track structure on a series of curves, theoretical and experimental investigations, gives recommendations for the establishment of the shortest lengths of straight track between curves, and for allowable train speeds on such curves. Composed on an operational basis are instructions for layout of successive curves and the shortest lengths of intervening straight track on existing lines. The book is intended for scientific and technical engineering railroaders. Chapters are: (1) Curve layout; (a) Types of curves and their classification, (b) Requirements for arranging successive curves, (c) Allowable train speeds on curves; (2) Research on the response of rolling stock on curves: (a) Initial conditions and assumptions; (b) Acceleration of the vehicle on the transition, (3) Theoretical investigations into oscillations of cars occurring during movement through curves: (a) Research on roll of passenger car bodies on curves and establishing the amount of stabilization, (b) Research on freight cars, (c) Analysis of results; (4) Experimental research on trajectory of cars during entry and exit of curve transitions and design of this segment of the track; (a) Characteristics of test sections and units of rolling stock--methods of experimental research; (b) Experimental research results; (5) Experimental research on cars on series of test curves and the results: (a) Characteristics of test sections, vehicle characteristics and test procedures, (b) Methods of calculating test results, (c) Analysis of research results, (d) Results of observations on reverse curves and analysis of results; (6) Practical recommendations for allowable speeds and shortest straight track segments linking curves. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 500, 1973, 97 pp, 41 Fig., 22 Tab., 49 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

#### 01 130210

#### THE STRUGGLE WITH THE WEAR OF WOODEN TIES [Iznos dereviannykh shpal i bor'ba s nim]

This monograph lays out the results of research into the causes of the formation and intensity of the accumulation of mechanical flaws of wooden ties during their operation; it also determines the dependence of the accumulated depressions in the ties under the linings on the size of the pressures acting upon them and the quantity of their forces (the weight stress of the lines) including the influence of various operational and constructional factors. In addition it works out a method for predicting the output (capacity) of the ties according to depressions under the linings, and puts forth the new integral-probability method of evaluation of the strength of the wooden ties, based on the integral calculation of the accumulated flaws for a given period of operation of the ties. Also laid out in the monograph is the calculated apparatus corresponding to the practice of differentiation of the bearing square linings and the density of the laying of the ties according to the weight tension of the lines. The book is intended for technical engineering and scientific workers of transportation management and economics. The specific chapters are: (1) Operation of the sleepers in the track; (2) Interaction of the sleepers with adjacent elements of the track; (3)

Reasons for weakening of the sleepers in rail lining zones in the process of operation; (4) Struggle against the formation of depressions in the sleepers under the linings; (5) Irregularity of cutting internal and external ends of the linings into the sleepers; (6) Dependence of the intensity of accumulation of depressions in the sleepers under the linings from stresses; (7) Influence of work conditions, timber types, and operational times of the sleepers on the intensity of accumulation of depressions under the linings; (8) Influence of the dimensions of depressions in the sleepers under the linings upon the stress-deformed condition of sleepers and the sleeper foundation; (9) Methodology for calculation of the carrying capability of the sleepers. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Lysiuk, VS

All-Union Labor Red Banner Railway Research Inst No. 445, 1971, 224 pp, 97 Fig., 63 Tab., 64 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

#### 01 130211

#### IMPROVEMENT OF DESIGN, PARAMETERS, AND QUALITY OF SWITCHES [Sovershenstvovanie Konstruktsii, parametrov i Kachestva strelochnykh perevodov]

This publication presents the following reports: (1) Contemporary status and prospective development of the design of switches; on the basis of current literature and the results of theoretical and experimental research an overview of switch design in the USSR and abroad is given. (2) Results of service tests of frogs of various types and brands; a methodology for evaluation of the durability of frogs. Highest indices developed on frogs strengthened by explosive hardening. Generally these average 1.5-1/6 times higher than that of standard frogs. (3) Reasons for formation of contact fatigue flaws in frog castings and ways of eliminating these. High manganese steel frogs were studied to develop the mechanism by which fatigue flaws are produced, also covered is evaluation of the chemical composition of the frogs, their mechanical properties, and the structure of the metal, as well as the effect of operating conditions on frogs. (4) Strength of the core of frogs which have been explosive hardened and the single and multiple stresses which are so produced. (5) Influence of the width of the flangeway of sharp frogs on the passage of wheelsets. (6) Research into influence of the flangeway of sharp frogs on rolling loads. (7) Definition of the optimum length of straight track segments between switches. (8) Definition of speed limits through complicated switchwork. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 431, 1971, 121 pp, 71 Fig., 22 Tab., 88 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

#### 01 130214

#### HANDBOOK FOR THE RUNNING MAINTENANCE OF RAILROAD TRACK [Instruktsiia po tekushchemu sodержaniu zheleznodorozhnogo puti]

This publication consists of the following chapters and appendices: (1) Fundamental regulations for the current repair of railroad track; (2) Technical conditions and norms for track maintenance: Rails, ties, ballast layer, fastenings, cross ties, rail anchors, track geometry, dimensions, layout for single and double-track, track on bridges and at crossings, tunnels, basic standards for maintaining switches, crossovers and crossings; (3) Prediction of track deterioration and evidence of this on rails, fastenings, ties and timbers, ballast layer, subgrade, switches and crossings and specifications for restoring them, maintenance of embankments; (4) Organization of work, evaluation of track repair; (5) Repair and storage of track maintenance equipment and materials. Appendices: Rails, fastenings, ballast cross sections on weak soil, wooden cross ties and crossing timbers, stress-strain diagrams for laying crossovers with specified ties and layout plans, standard transverse subgrade profiles, technical instructions for locating crossovers during construction of new ones, development and rebuilding of existing stations, table for fitting out production track maintenance organizations, a



table of hand tools, signal devices and inventory for routine track maintenance. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1974, 223 pp, 103 Fig., 24 Tab., 9 App.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

#### 01 130215

**LEADING TECHNICAL MATERIALS: CLASSIFICATION OF RAIL DEFECTS AND DAMAGE RTM 32/TSP-1-66; CATALOG OF RAIL DEFECTS AND DAMAGE RTM 32/TSP-2-66; INDICATIONS OF DEFECTIVE AND DANGEROUSLY DEFECTIVE RAILS RTM 32/TSP-3-66** [Pukovodiashchie tekhnicheskie materialy klassifikatsiya defektov i povrezhdenii rel'sov RTM 32/TsP-1-66; katalog defektov i povrezhdenii rel'sov RTM 32/TsP-2-66; priznaki defektnikh i ostrodefektnykh rel'sov RTM 32-TsP-3-66]

The technical material presented in three reports on rail flaws: (1) The classification of defects and rail flaws intended for identification for statistical evaluation of rails removed from track due to development of defects; rails are classified according to their appearance and type of defect with methods of appraisal being explained. (2) Catalog of defects and rail flaws. (3) Signs of defective and "sharp" flaws. (4) References provide extensive visual and statistical information. The pamphlet is illustrated with photographs of defects and flaws, including specific descriptions and careful classification. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1967, 64 pp, 82 Fig., 3 Tab., 58 Phot.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

#### 01 130252

**THE EFFECT OF REINFORCEMENT ON THE FROST RESISTANCE OF REINFORCED CONCRETE CROSS TIES**

[Ovliviani armatury na morozostoikost' cturnobetonnykh shpal]

Type C-56 reinforced concrete crossties have been widely utilized on USSR railroads. Observations reveal the generally satisfactory operation of these ties in the track. Nevertheless, on several sections of the North Caucasus road following a 2 to 3 years service the number of defective ties reached 2%. The most widely distributed and dangerous of the crossties defects are a) fissures, b) stripping of the metal at the ends of the ties, c) beating down of the concrete at the end of the tie, and d) transverse fissures on the sleeves. All the above flaws are the result of the same cause, namely the onset and development of fissures. It has been established that the destruction of crossties begins with the appearance of a hairline fissure in the protective layer of concrete over the metal. Then further occurs an intensive expansion of the fissure and its growth in length. When the transverse fissures reach the section beneath the rail the tie is destroyed along the diagonal or normal plane. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Mamontov, Iu A Nevskii, VA *Vestnik Ts.N.I.I.* No. 6, 1968, pp 48-50, 4 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: All-Union Labor Red Banner Railway Research Inst USSR Ministry of Railways, Moscow, USSR

#### 01 130269

**ULTRASONIC CHECKING OF INSTALLED RAILWAY RAILS WITH THE UTILIZATION OF ELECTROMAGNETIC ACOUSTIC CONVERTERS** [Ul'trazvukovoi kontrol' zheleznodorozhnykh rel'sov ulozhennykh v put's ispol'zovaniem elektromagnitno akusticheskikh preobrazovatelei]

Magnetic and ultrasonic flaw detectors are applied for the mobile checking of rails. The test car's flaw detector has the deficiencies of relatively low sensitivity to defects within the railhead, at 7 mm. and over from the surface, to small defects, and also can not reveal defects in the web of the rail. A trait

of the magnetic flaw detector is the possibility of operation in a wide range of temperatures and at high speeds, without moistening the rolling surface of the rail. The ultrasonic railcar flaw detector is more sensitive to small defects and reveals defects in the web of the rail. Its main deficiency is the necessity of applying liquids (usually water or alcohol) for the insurance of acoustical contact between the probe and the object checked. The quality of the acoustical contact depends upon the uniformity of the liquid inflow, the level of turbulence of the flow, and upon the accumulation of dirt on the rails. Figures include a plan of the excitation of ultrasonic oscillations with the aid of the electromagnetic acoustical converter, a plan of the searching system, and a block plan of the apparatus. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Vlasov, VV *Soviet Journal of Nondestructive Testing* No. 3, 1971, pp 94-98, 4 Fig., 4 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: ESL

#### 01 130271

**COMPUTING THE EDDY CURRENT COMPONENT OF A DEFECT FIELD DURING MOBILE ELECTROMAGNETIC FLAW DETECTION OF RAILS** [K raschetu vikhretokovoi sostavliaiussheiei polia defekta skorostnoi elektromagnitnoi defektoskopii rel'sov]

Railroad rails, during mobile electromagnetic flaw detection, are exposed to the action of the moving permanent magnetic field created by the horseshoe shaped electromagnet. At this time eddy currents are led into the rails, and the dynamic field of the defect is formed because of the change of magnetization of the rail in the zone of the defect (magnetostatic component of the field of the defect), as well as due to the redistribution of the eddy currents by the defect (the eddy current component of the defect field). The magnetostatic defect field, which is in a given instance the component of the dynamic field, has been studied in detail in a series of theoretical and experimental works. In distinction to this, the eddy current component is generally defined by the resiliency and redistribution of the eddy currents, which are unipolar according to the means of reception, in addition to which the direction and distribution in the unflawed rail depends upon their position in relation to the source of the external magnetic field. The differences in the dimensions and polarities of the calculated components of the eddy current field of the rail defects agree with the data of the study on signals in the inductional data unit of the flaw detector railcar. A comparison of the dimensions of the components of the eddy current field over the defects and over the sound sections of rail lead to the conclusion that a data unit reacting to the vertical component of the defect field would be most effective for the revelation of internal defects. Least effective will be a data unit which reacts to the longitudinal component of the defect field and has a very small dimension over the internal defects and a significant one over the sound sections of the rail. In order to reach practical conclusions, it is necessary to observe not only the eddy current component of the defect field but the magnetic as well. This is necessary because the source of the eddy currents in the rails is a moving permanent field of large size, which leads to the presence on the rail surface of an auxiliary background field and the formation over the defects of field changes of a magnetic character. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Shcherbinina, VA Vlasov, VV Dovnar, BP *Soviet Journal of Nondestructive Testing* No. 2, No Date, pp 14-21, 3 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: ESL

#### 01 130311

**RESEARCH ON THE OPERATION OF A FROG WITH A CONTINUOUS ROLLING SURFACE. DYNAMIC TESTING OF A CROSSOVER WITH A CONTINUOUS ROLLING SURFACE** [Issledovanie raboty krestoviny s nepreryvnoi poverkhnost'iu kataniiia. Dinamicheskie isspytaniia perevoda s nepreryvnoi poverkhnost'iu kataniiia v puti]

To achieve high passenger train speeds a whole series of problems must be solved--the creation of rolling stock with improved suspension components, switches allowing such speeds and reliable and fast-acting signals with centralized traffic control and communications. Dynamic tests of frogs under the passage of a freight train moving below 100 km/hr showed high



stability and allowed recommendation of this design for further testing. Dynamic testing of test frogs beneath scheduled freight and passenger trains showed: (1) The cast portion of the rail wing manufactured from high manganese steel has a sufficient safety factor; (2) The movable point manufactured from special profile ramp rails, in light of its capacity, has almost a double safety factor; (3) The maximum measured transverse movement of the wheels within the limits of the frog did not exceed 1.8 mm, with a mean of 1.1 mm.; (4) The transverse forces and stresses in the resilient points during the movement of the frog agrees well with calculations. Until these tests were carried out, the permissible speed straight through a switch was 160 km/hr and for the diverging movement 50 km/hr; further testing at speeds up to 220 km/hr can be recommended. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways, Lenin Institute of Railroad Transport Engineers 1973, 44 pp, 11 Fig., 10 Tab., 4 Phot.

ACKNOWLEDGMENT: FRA

ORDER FROM: Lenin Institute of Railroad Transport Engineers Leningrad, USSR

#### 01 130312

**EXPERIMENTAL TESTING OF A FROG OF THE TYPE P65 MARK 1/11 WITH A MOVABLE POINT FOR SPEEDS UP TO 200 KM/HR IN STRAIGHT LINE** [Eksperimental'nye issledovaniia opytnykh krestovin tipa P65 Marki 1/11 s podvizhnymi serdechnikami dlia skorostei dvizheniia po priamomu napravleniiu do 200 km/ch]

The increase in train speeds through switches presents one of the most important problems in increasing railroad line capacity. Switches have until now limited speed due to their design characteristics. Variations in geometry at switch and frog, as well as wheel irregularities, leads to a significant increase in dynamic shock forces in the interaction between wheel and rail. The best design for switches are the P50 and P65 types, Brand I/II. These were tested at speeds up to 220 km/hr. Results revealed that (1) Stresses in the load-carrying elements did not exceed the permissible; (2) Changes in wheel paths through the switch did not exceed certain limits which are presented in tabular form; (3) The vertical and horizontal wheel forces acting on the rail of the switches are within Ministry of Railways specification; (4) Vertical accelerations on the journal boxes of the test train during movement through the switch and frog are practically identical. The report also presents information relative to characteristics of the test section, test train, plans for installing instrumentation and the apparatus used in the tests. Also included are data on stresses in the movable point, switch points and stock rail, stresses in the cast portion of the wing rail, stresses beneath the rail head on the chamber of the cast portion, variation of the wheel path, vertical and horizontal forces and vertical accelerations of the journal box. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1971, 94 pp, 25 Fig., 30 Tab., 8 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmannaya 2, Moscow B-174, USSR

#### 01 130313

**SHORT EXPOSITION ON TESTING METHODS FOR EXPERIMENTAL RAILS AT THE TS.N.I.I. M.P.S. TEST LOOP** [Kratkoe izlozhenie metodiki ispytaniia opytnykh rel'sov na kol'tse Ts.N.I.I. M.P.S.]

This is a short exposition of the investigation methods for track on the test loop of the Central Scientific Research Institute of the the U.S.S.R. Ministry of Railroads. It covers test designs of an upper track structure on concrete slab foundation; these are reinforced concrete slabs. Type 4-U, with rail reinforcement ZHBP and BS-I. Diagrams of these reinforcements are included. The report goes on to discuss small dimension frames and concrete ties pre-stressed for heavy wheel loads with experimentally designed rail reinforcements. Fundamental characteristics of railroad ties are discussed and a photograph shows ties with KB reinforcement, and diagrams of BP-65, 2HBR-65, and KB-65 reinforcements. Prestressed concrete ties with wire rope are included. Covered in detail are the standard railroad switch P65, railroad frog type P65 with movable point, railroad switch type P65 brand I/II, and finally a track section on asbestos ballast. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways No Date, 16 pp, 5 Fig., 6 Phot.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmannaya 2, Moscow B-174, USSR

#### 01 133229

**TECHNICAL DATA BASES REPORT. BALLAST AND FOUNDATION MATERIALS RESEARCH PROGRAM**

Literature and other information sources pertaining to properties of granular materials, ballast and sub-ballast materials, fine-grained soils, and structural behavior models were reviewed. Presented in this report is a summary of the current technology relative to the following: (1) procedures for evaluating ballast and subgrade material properties; (2) factors which influence ballast and soil material properties; (3) relations between ballast and soil material properties and track system behavior and performance; (4) applicability of structural analysis models to predicting behavior of track system; (5) transfer functions relating track behavior to performance. Based on the review, it is concluded that ballast and subgrade materials receive inadequate considerations in analysis and design, more realistic models are available for structural analysis of track systems, transfer functions relating track behavior to performance are not available and climatic factors exert a significant influence on behavior and performance and must be given appropriate consideration in analysis and design of the track system.

Robnett, QL Thompson, MR Hay, WW Tayabji, SD Knutson, RM

Illinois University, Urbana, Federal Railroad Administration Summ. Rpt. FRA/ORD-76/138, July 1975, 179 pp

Contract DOT-FR-30038

ACKNOWLEDGMENT: NTIS

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PB-251771/AS, DOTL NTIS

#### 01 133411

**LONGITUDINAL FORCES IN RAILROAD TRACK**

The work is devoted to the theory of design computations for track subjected to thermal and creep forces. The theory of longitudinal forces and displacements arising in continuous welded rail (CWR) track due to temperature changes is mathematically developed. A description of results of experimental investigations of the operation of CWR track is given, with the subsequent determination of parameters and functions which characterize the behavior of the track under the influence of temperature changes. Results of investigations of longitudinal forces in CWR track resulting from moving trains are presented. The work contains an investigation of railroad track stability. The problem is solved in a nonlinear formulation, under assumption that the rail is subjected to passive loads without any restrictions on the dependence of these quantities on the corresponding displacements.

Trans. of mono. Centralny Nauchno-Isslodovatel'skiy Institut Inzhenerov Zheleznodorozhogo Transporta, n.p. 1967, by M. Yanowitch.

Kogan, AY

Federal Railroad Administration FRA/ORD-76-11, 1967, 218 pp

ACKNOWLEDGMENT: NTIS

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#### 01 138071

**LEVELLING AND TAMPING FOUR SLEEPERS SIMULTANEOUSLY**

Doubling output by adding a second tamping group to their new series 07 lining, levelling and tamping machine, the Quatromatic, Plasser & Theurer can provide an effective performance of 2000 m/h to accommodate shorter possessions on busy lines.

*Railway Engineer* Vol. 1 N Jan. 1976, pp 44-45

ACKNOWLEDGMENT: British Railways

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

01 139440

**THE DISPOSAL OF DISCARDED RAILROAD WOOD CROSS TIES. A STUDY OF ALTERNATIVES**

Historically, approximately 25,000,000 wooden railroad cross ties must be replaced each year. In the past, these ties were usually burned near the point of removal; a number were left in a convenient place and made available to local farmers or homeowners. Two significant changes have occurred which have rendered these disposal methods ineffective. The first change was the adoption and widespread use of the tie saw as a tie removal tool. It was adopted to minimize the disturbance to the roadbed during tie removal and increase the production of tie gangs. It also made the ties, which were now removed in three pieces, practically useless to farmers and homeowners. The second change was the promulgation of pollution control regulations by various governmental bodies. As a result of these regulations, it is not permissible in most States to burn cross ties. Therefore, both methods previously used to dispose of the cross ties removed from track have been rendered unavailable. This means that millions of waste cross ties are accumulating and the annual increments will increase as more attention is placed on upgrading the Nation's roadbeds. This study has explored new disposal methods for discarded cross ties with the most emphasis being given to methods which have the potential for generating revenue. The most promising methods have been developed sufficiently to make it possible for the railroads to use the technology immediately.

Prepared for AAR.

Dolby, AJ

Illinois Central Gulf Railroad Dec. 1975, 58 pp, Figs., Tabs.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

01 139466

**SOVIET STANDARDS FOR CALCULATING LABOUR COSTS FOR ROUTINE TRACK MAINTENANCE [Sowjetische Normen zur Berechnung des Arbeitskratteaufwands fuer die laufende unterhaltung des Gleises]**

No Abstract. [German]

Funke, H *Signal und Schiene* Vol. 20 No. 1, Jan. 1976, pp 6-9, 6 Tab., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Transpress VEB Verlag fuer Verkehrswesen Franzoesische Strausse 13-14, 108 Berlin, East Germany

01 139471

**OPTIMISATION OF THE PARAMETERS OF THE TRACK ALIGNMENT RECTIFIER SYSTEM [Optimizacija parametrov puteriktovocnyh sistem]**

Continuously operating machines for rectifying track alignment form, together with the track panel, a "machine-track" closed circuit. Recorded values are compared against predetermined settings. The article explains a method for optimising track alignment rectifier systems. Spectral analysis is applied for information concerning the running surface of the track. The parameters of a 3-point and a 4-point system with smoothing are examined. For the rectification diagram of the 3-point and 4-point systems with measuring apparatus arranged symmetrically, the measuring cord which is close to optimum length, is 50 metres long. [Russian]

Zubec, BM *Vestnik Vniizt* Vol. 35 No. 2, 1976, pp 34-37, 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Vestnik Vniizt 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

01 139477

**INCREASED EXPENDITURE ON BALLAST IN THE CONSTRUCTION OF NEW RAILWAY LINES [Zwiekszone zuzycie materialu podsypkowego przy budowie nowych linii kolejowych]**

The Civil Engineering Institute of Warsaw Technical University has completed a study on the problem of expenditure on stone chippings for ballast on new lines, in connection with the PKP's recently laid CMK/Silesia-Warsaw High-speed Trunk Line. When calculating this expenditure, a thicker layer of ballast was provided for at the outset, to allow

for future settling under the traffic load. The calculation formulae are followed by an analysis of the factors which determine the additional ballast requirements. [Polish]

Makowski, J *Przeglad Kolejowy Drogowy* Vol. 22 No. 12, Dec. 1975, pp 16-21, 3 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Wydawnictwa Komunikacji i Lacznosci Ul Kazimierzowska 52, Warsaw 12, Poland

01 139487

**TURNOUTS AND CROSSOVERS FOR 230 KM/H**

French National Railways in designing the Paris-Lyon 260 km/h line have to introduce point work to suit as high a speed as possible and preliminary installations are presently under successful trial embodying new geometrical approaches.

Oeconomos, J *Railway Engineer* Vol. 1 No. 2, Mar. 1976, pp 25-26, 4 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

01 139488

**EFFECT OF FOUNDATION STIFFNESS ON TRACK BUCKLING**

The present paper deals with the effect of releasing the constraining assumption of using an infinitely rigid foundation in the analysis of vertical buckling of a railroad track due to constrained thermal expansion. The chosen foundation is of the Winkler type. The buckled configuration is assumed to consist of two regions, i.e., a lift-off region and an attached region. The foundation resistance to the longitudinal displacement of the track is assumed to be linear. The problem is treated as a variational problem with variable end points for which the variational formulation yields a consistent set of differential equations and boundary conditions. It is found that a decrease in the foundation stiffness will increase the "safe buckling temperature." However, for the working range of an actual foundation, this increase is small and the assumption of an infinitely rigid base can be used to predict a close lower bound for the "safe buckling temperature."

El-Aini, YM *ASCE Journal of the Engineering Mechanics Division Proc Paper* Vol. 102 No. EM3, No. 12216, June 1976, pp 531-545

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

01 139939

**INNOVATIONS IN FROG AND SWITCH DESIGN**

Innovations in special trackwork design and development by Canadian Pacific are described. This involves special switch designs, new designs of railbound manganese spring frogs and investigation into the design and use of swing-nose frogs. These are used on single-track mainlines used by many unit trains with total traffic of 50 million gross tons per year. The result has been a main line turnout that has a significantly longer service life with reduced maintenance costs.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976.

Taylor, EH (Canadian Pacific)

American Railway Engineering Association Proceeding Vol. 77 Bulletin 658, 1976, pp 652-664, 11 Fig.

ORDER FROM: ESL

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01 139941

**RAIL WEAR AND CORRUGATION STUDIES**

Canadian National has developed the mechanisms causing rail wear. While efficient remedial action is possible, it does require concerted effort by engineering, equipment and transportation functions. The forms of fast wear--gauge face, head flow and corrugation--are each caused by a different process, all of which are described. The recommendations for each problem are shown in tabular form. Unit trains complicate the problem and actions must be taken to counter their adverse effects.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976.

King, FE (Canadian National Railways); Kalousek, J (Canadian Pacific)  
American Railway Engineering Association Proceeding Vol. 77 Bulletin  
658, 1976, pp 601-620, 14 Fig., 3 Tab.

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#### 01 139946

##### TRACK MAINTENANCE FOR HIGH-SPEED TRAINS

To prepare its mainlines for high-speed trains, British Railways has made changes in track structures and track maintenance. Evolution to the present design of concrete cross tie and rail fasteners is described, and the conversion to welded rail is discussed. The depth of ballast was increased and the quality standards improved. The maintenance machines and maintenance techniques have also been altered. Brief mention is made of glued joints, rail welding, manual/mechanized ballast packing, rail drilling and sawing, and rail destressing and restressing.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976.

Jenkins, HH (British Railways Board)  
American Railway Engineering Association Proceeding Vol. 77 Bulletin  
658, 1976, pp 499-521, 2 Fig., 12 Phot.

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#### 01 139959

##### ASPHALTIC RAILWAY BED FOR DEUTSCHE BUNDESBahn

Shell Oil has worked with the German Federal Railway in development of an asphaltic-bed track with the following advantages being sought: ballast fouling is prevented; ballast density is unaffected by heavy and high-speed traffic; smooth surface provides easy footing for railway personnel and may be readily cleaned in stations; track stability is improved; and maintenance requirements are minimal. A 10-m test section was installed in a main track at Munich in 1974. Details of the installation are given. Tests are to continue for several years on the line which carries 40,000 tons of traffic daily at speeds up to 80 km/h.

Metelmann, P (Deutsche Shell AG) *Shell Bitumen Review* Mar. 1976, pp 3-8, 12 Fig.

ORDER FROM: ESL

#### 01 141118

##### THE LATEST CONCRETE-TIE TEST SECTIONS: WHAT HAS BEEN THEIR PERFORMANCE?

Service installations of concrete cross ties conforming to the latest AREA specifications are now under observation in heavy-duty track on four railroads. This article reports the results of recent inspections of these installations.

Weber, J (Portland Cement Association) *Railway Track and Structures*  
Vol. 72 No. 8, Aug. 1976, pp 32-35, 6 Phot.

ORDER FROM: ESL

DOTL JC

#### 01 141120

##### SYSTEMWIDE UNDERCUTTING PROGRAM FOR BESSEMER & LAKE ERIE

Heavy traffic in bulk commodities leads to degradation and fouling of the ballast of the Bessemer & Lake Erie. The resulting muddy condition is being combatted with a systemwide undercutting program which will replace all fouled ballast over a 5-year cycle. The result will be increased traffic capacity since surfacing cycles will be increased from as often as once yearly and track occupancy time required by maintenance of way forces will be reduced.

*Railway Track and Structures* Vol. 72 No. 7, July 1976, pp 13-15, 5 Phot.

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#### 01 141121

##### HOW AUTOMATED TRACK-LINING AND RAISING SYSTEMS WORK...1-THE JACKSON SYSTEM

Each automated production tamper has its own system for determining the errors that exist in track line and surface and of converting this information into signals to devices that make necessary corrections in track geometry. In this first of a series, the Jackson Railroad Equipment Co. system is described. Corrections in both surface and alignment are made through use of light beams, sensors and electrically controlled servo valves that actuate the flow of oil to hydraulic cylinders.

Part 1 of a three-article series; see also Part 2, RRIS 01 141564, and Part 3, RRIS 01 142950, Bulletin 7701.

Bradshaw, BW (Jackson Railroad Equipment Company) *Railway Track and Structures* Vol. 72 No. 7, July 1976, pp 25-27, 5 Fig.

ORDER FROM: ESL

DOTL JC

#### 01 141130

##### A STUDY OF STRESSES AND DEFORMATIONS UNDER DYNAMIC AND STATIC LOAD SYSTEMS IN TRACK STRUCTURE AND SUPPORT

An investigation of the selection of ballast using standard and modified standard classification tests is reported. The results enable ballasts to be selected with better reliability in regard to their satisfactory performance in the railroad bed. Where necessary, the tests were performed on ten ballasts in order to see which, if any, correlated with their field performance. The field performance in terms of stability and in terms of breakdown of the ten ballasts was obtained from a CN field test. In addition, the behaviour of a layer of ballast was investigated under ideal loading conditions. Standard and repeated loading triaxial tests investigate the fundamental stress-strain characteristics of the ballast. These were supplemented by a model full-scale test. The results of this additional work will improve the specifications for the initial compaction of a layer of ballast and for the tie configuration to give the best subsequent performance under load. In the future it should lead to the development of a theoretically valid design method for the complete road bed.

Raymond, GP Gaskin, PN Van Dalen, K Davies, JR  
Canadian Institute of Guided Ground Transport, (Proj. No. 222) No. 75-10, Sept. 1975, 53 pp, 20 Fig., 6 Tab., Refs., 2 App.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

#### 01 141447

##### RELATIONSHIP BETWEEN TRACK ELASTICITY AND THE RAIL SUPPORT [Zusammenhang zwischen der Federzahl des Gleises und der Federzahl der Schienenunterstützung]

The author attempts to define track elasticity and track stability. He establishes the relationship between specific bending of track and that of the rail support taking as a basis the example of a through girder placed on separate supports which can be made less resilient, and draws conclusions, for track elasticity and stability. [German]

Laetsch, P *DET Eisenbahntechnik* Vol. 24 No. 5, May 1976, pp 215-217, 1 Fig., 1 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: VEB Verlag Technik Oranienburgerstrasse 13-14, 102 Berlin, East Germany

#### 01 141449

##### STATIC RESISTANCE OF THE TRACK UNDER LATERAL STRESSES [Der statische Querverweibewiderstand des belasteten Gleises]

It is impossible to achieve a completely accurate assessment of the resistance of the track to lateral stresses with all the possibilities of deformation involved. With regard to physical problems, an attempt is made to reach a result through calculations based on laboratory and track tests. The resistance R to lateral stresses depends largely on the displacement distance, even if this is small. There is no similarity with Hooke's law, but the relation between R and the lateral stress is linear. [German]

Klugar, K *Eisenbahntechnische Rundschau* Vol. 25 No. 4, Apr. 1976, pp 211-216, 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

01 141452

**TRACK CURVE MEASUREMENT AND CALCULATION USING ANGULAR COORDINATES [L'arpentage et le calcul des courbes de voies a l'aide des coordonnees de representation angulaire]**

The author describes this method of calculating and representing track curves in detail and explains its advantages over conventional methods of determining these values using Cartesian coordinates. [French]

Boese, E *Rail International* No. 6, June 1976, pp 368-374, 5 Fig., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
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DOTL JC

01 141455

**THERMIT WELDING PROCESSES FOR SPECIAL STEEL RAILS [THERMIT-Schweisverfahren für Schienen der Sondergueten]**

The authors describe modern thermit welding processes and their use taking account of the special measures to be taken for rails made of special steels; they call attention to the particular effects of heat on the rails. On the basis of the results from analysis of materials, they show how special steel rails are suitable for thermit welding. [German]

Fricke, HD *Eisenbahntechnische Rundschau* Vol. 25 No. 4, Apr. 1976, pp 199-208, 14 Fig., 1 Tab., 56 Ref.

ACKNOWLEDGMENT: Eisenbahntechnische Rundschau  
ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

01 141461

**LAYOUT AND MAINTENANCE OF RAILWAY TRACKS [Trassieren und Erhalten von Eisenbahngleisen]**

After a brief review of the development of layout techniques, the author describes the difference between the reactions measured on vehicles and results from the mathematical model used as a basis for the layout. From the random association of factors affecting the quality of the track, he determines the difference between regular and limit values for defining the layout. Defective areas recorded during acceleration measurements with a testing vehicle are mostly connected with forced critical points. The author concludes by deducing rules for the construction of new tracks from the results and measurements. [German]

Weigend, M *Eisenbahningenieur* Vol. 27 No. 5, May 1976, pp 183-189, 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Dr Arthur Tetzlaff-Verlag Niddastrasse 64, Frankfurt am Main, West Germany

01 141564

**HOW AUTOMATED TRACK-LINING AND RAISING SYSTEMS WORK...2- THE PLASSER SYSTEM**

This second in a series of articles on systems used for detecting errors in line and surface for conversions into signals that govern the raising and lining devices on production machines describes the Plasser automated system. The Plasser proportional system is based on analog signals for correcting surface, cross-level and lining deviations which actuate electrically controlled servo hydraulic valves. These valves control the speed of hydraulic cylinders.

Part 2 of a three-article series; see also Part 1, RRIS 01 141121, and Part 3, RRIS 01 142950, Bulletin 7701.

Seylehner, G (Plasser-American Corporation) *Railway Track and Structures* Vol. 72 No. 9, Sept. 1976, pp 28-30, 7 Fig.

ORDER FROM: ESL

DOTL JC

01 141567

**PACT PROVES ITS WORTH IN SPECIAL APPLICATIONS**

The eight years since the first experimental length of paved concrete trackbed (PACT) was laid in Britain have seen growing acceptance of this design if maintenance-free track is desirable such as in tunnels and viaducts where mechanized maintenance is difficult. No substantial length of PACT has yet been laid, although first cost is now only one third greater than for conventional track. One obstacle (except on entirely new lines) is the lengthy possessions required for the sophisticated slip-form paving process. PACT is being tested on the Spanish National Railways and New Zealand Railways, as well as on British Railways which will use it in the 7-km tunnel under the Severn estuary.

*Railway Gazette International* Vol. 132 No. 8, Aug. 1976, pp 297-301, 1 Fig., 7 Phot.

ORDER FROM: ESL

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01 141651

**GLUED INSULATING JOINTS IN LONG WELDED RAILS [Geklebte Isolierstoesse in durchgehend verschweissten Gleisen]**

Technical method and advantages of using these fish plated and metal bolted joints which are insulated from the rail by a layer of glue. [German]

Uni, B *Zeitschrift der OSShD* Vol. 19 No. 1, 1976, pp 14-16, 5 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Railway Cooperation Organization (OSShD) Hoza 63/67, Warsaw, Poland

01 141683

**INDUSTRY CAPABILITY TO PRODUCE RAIL AND CROSSTIES FOR NATIONWIDE RAILROAD TRACK REHABILITATION**

If a nationwide track rehabilitation program is undertaken, either by providing direct Federal financial assistance to the railroads or by the Government taking over the roadbeds, the adequacy of supplies of rail and ties is crucial. If the rehabilitation time frame is short, Congress could encourage production of large quantities of track to be rehabilitated and by guaranteeing the purchase of minimum orders of rail and crossties. GAO illustrated the industry's capacity by studying 25 Class I railroads, estimating the rail and crossties needed to put the nation's track in a secure condition over 10-, 15- and 20-year periods. Present level of rail production is insufficient for normal maintenance, domestic suppliers are reluctant to expand and imported rail could become important. Wooden crosstie supply should be adequate but will be subjected to higher price pressures.

This report was requested by the Chairman, Subcommittee on Federal Spending Practices, Efficiency and Open Government, Senate Committee on Government Operations.

General Accounting Office, (B-164497(5)) Cong. Rpt. CED-76-150, Sept. 1976, 49 pp, Photos., 2 App.

ORDER FROM: General Accounting Office Distribution Section, Room 4522, 441 G Street, NW, Washington, D.C., 20548

01 142252

**THEORETICAL STUDY OF MECHANICAL PROPERTIES OF ELEVATED OPEN-FLOORED DIRECT-FASTENED TRACKS**

Direct attachment of rails to elevated open-floored structures to assure they will be self-clearing in snowstorms produces a track structure different mechanically from either conventional ballasted track or concrete slab track. Normally there is little deformation, but should the structure deflect, the resulting track deflection is difficult to correct. Japanese National Railways has tested such construction on the Kansai line at speeds to 100 km/h, and is considering it for extensions of the Shin Kansen network. With use of a rubber mat, this elastic track structure is rated capable of operations to 260 km/h for the high-speed trains.

Miura, S

Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 36-37, 5 Fig.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

01 142254

**APPLICATION OF FLUIDIC DEVICES TO A SPRINKLING NOZZLE WITH THE AIM OF MELTING SNOW ON THE TRACK**  
One of the most important technical problems in extension of the Shin Kansen high-speed rail network is development of countermeasures for snow in regions where fall is heavy. Sprinkling of water through a special self-oscillating sprinkling nozzle has been investigated as a method for rapid removal of snow from the track. Delivery of relatively large droplets from fluidic devices on the wayside requires development.

Ohyama, T  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 41-42, 4 Fig.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

01 142264

**HEAT UP TEST OF LONG WELDED RAIL ON SLAB TRACK**  
To study forces acting on slab track caused by thermal expansion of long welded rail or of the concrete slabs, heating tests were conducted on a newly built section. Special effort was made to eliminate residual forces at the beginning of the experiment. It was proved that longitudinal force caused by welded rail acting through the track fasteners is about 60 percent of the design value. Lateral force and distortion of the track is comparatively small.

Miura, S  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 2, 1976, pp 86-87, 5 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

01 142298

**RESULTS OF TESTS ON THE DR'S IMPROVED RAILS**  
[Ergebnisse der Erprobung vergueteter Schienen bei der DR]  
The author first briefly describes the steel of the rails used in the test, then the improvement technique and the chief mechanical characteristics obtained. He gives the results obtained with improved rails in curves with different radii. He also proposes a relationship between the wear ratio of untreated and treated rails, and the curve radius of the line. To conclude, he refers to the saving to be made with improved rails. [German]

Herbst, B *DET Eisenbahntechnik* Vol. 24 No. 6, June 1976, pp 276-270, 1 Fig., 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik Oranienburgerstrasse 13-14, 102 Berlin, East Germany

01 142304

**THE INTERACTION OF UNLOADED RAILS IN CALCULATING THE SUPPORTS OF POINTS AND SWITCHES** [Das Mitwirken der unbelasteten Schienenstränge beim Berechnen von Weichen-Unterschwellungselementen]  
When a train passes over the points at a turnout, all the rails cannot be under load at the same time. The unloaded rails resist the deformation of the rail support at the turnout under the load. This resistance acts as a reactive force on the switch support components. This problem is particularly important for the design of the reinforced concrete slab bases, because of the possible negative bending moments in the areas of parts weakened by the rail fasteners. The author gives some logic-mathematical models to provide a hypothesis and a calculation formula. [German]

Arnhold, G *DET Eisenbahntechnik* Vol. 24 No. 6, June 1976, pp 262-265, 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik Oranienburgerstrasse 13-14, 102 Berlin, East Germany

01 142313

**PROGRESS WITH COAL SLURRY PIPELINES**  
Coal slurry pipelines are superior to rail transportation in most of the areas discussed here. This does not lead to the conclusion that they should replace

rail coal shipping, since pipelines are only adaptable to situations where there are large, stable volumes of coal to be delivered over fixed routes. Rail transportation will remain essential for hauling the majority of the coal tonnage. The role of the coal slurry pipeline is to increase total energy transport capacity and to mitigate the social and environmental impact of rail operations in the West.

See also RRIS 21 136398.

Wasp, EJ (Bechtel Corporation) *Mining Congress Journal* Vol. 62 No. 4, Apr. 1976, pp 27-32, 4 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

01 142498

**BETTER RAILWAY TRACK**  
Some of the shortcomings of conventional railway track are pinpointed and an alternative design using novel principles designed to overcome these shortcomings, is investigated. The track structure proposed is ballastless. Its performance is predicted and compared with that of conventional track and also of concrete slab track. Technical and economic factors involved in the efficient operation of railway track are considered in their proper perspective.  
/Author/ /TRRL/

Maynier, LXH *Civil Engineer in South Africa* Vol. 18 No. 6, June 1976, pp 125-130, 7 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 221921)  
ORDER FROM: ESL

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01 142522

**EXPERIMENTAL TRACK WITH REINFORCED CONCRETE SHELL-TYPE SLEEPERS** [Experimentellen Obenbau mit Schalenschwellen aus Stahlbeton]  
The author describes a reinforced concrete sleeper in the form of a cylindrical shell, its constructional design and its testing in the laboratory and on a test track. Compared with the beam-shaped sleeper, the shell type offers considerably more track stability. [German]

Mazur, S *DET Eisenbahntechnik* Vol. 24 No. 7, July 1976, pp 307-310, 2 Fig., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik Oranienburgerstrasse 13-14, 102 Berlin, East Germany

01 142524

**ARTICLE 1: TEST WITH CREOSOTED BEECHWOOD SLEEPERS IN A TROPICAL RAINFOREST CLIMATE (SCHULZ)**  
**ARTICLE 2: DURABILITY OF CARBON CREOSOTE USED WITH BEECHWOOD SLEEPERS IN TROPICAL CONDITIONS (BECKER AND PETROWITZ)** [Article 1: Ein Versuch mit teerelgetraenkten Buchenschwellen im tropischen Regenwald-Klima. Article 2: Bestaendigkeit von Steinkohlenteerel in Buchenschwellen unter tropischen Bedingungen]  
The two articles describe a test carried out with beechwood sleepers soaked in creosote laid on a line in Liberia used for ore transport. The purpose of the study was to examine how long this particularly suitable type of creosote protects the wood and to check the suitability of beechwood sleepers for use in these climatic conditions. Interim results show already that, even in extreme climatic conditions, creosoted beechwood sleepers have a long service life provided the absorption rate of the creosote is between 200 and 250 kg/cu m and that the sleepers are treated with carbon creosote enriched by high average boiling. [German]  
Article 1: pp 37-46; Article 2: pp 53-71.

Shulz, G Becker, G Petrowitz, H-J *Die Holzschwelle* Vol. 71 No. 83, Aug. 1976, 29 pp, 4 Tab., 17 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Studiengesellschaft fuer Holzschwellenoberbau EV Waldstrasse 11, Bonn-Ippendorf, West Germany

01 142526

**FINITE ELEMENT NON-LINEAR ANALYSIS OF CONCRETE STRUCTURES**

The non-linear analysis of reinforced concrete structures using finite element techniques is presented. Tensile cracking, the multiaxial compressive response of concrete and the yielding of steel reinforcement are the main non-linear effects studied. Several models of multiaxial material behaviour, based on experimental data obtained elsewhere, are discussed. Isoparametric elements, under plane and axisymmetric conditions, are used throughout. Special elements are used to simulate reinforcement, liners, prestressing cables and jackets. These features were incorporated into incremental non-linear finite element programs which embraced both variable and constant stiffness methods of solution. Several realistic concrete structures are analysed and the solutions are compared with experimental evidence.

Phillips, DV Zienkiewicz, OC *Institution of Civil Engineers, Proceedings* Proceeding Vol. 61 No. 2, Mar. 1976, pp 59-88

ACKNOWLEDGMENT: British Railways

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01 142601

**INVESTIGATING THE GROWTH OF TRANSVERSE FATIGUE CRACKS IN RAILS [Issledovani rosta poperechnykh ustalostnykh trëshchin v rel'sakh]**

The most dangerous of rail flaws are transverse fatigue cracks which develop gradually inside the rail head and can produce brittle fracture under the passage of a train. This study covered qualitative and quantitative analyses of the service life of rails in which such cracks develop. A line with heavy freight traffic was used to measure the growth of such cracks. A laboratory procedure involving a load pulsator then reproduced these conditions. Conclusions: (1) Transverse fatigue cracks develop exponentially under either actual service or laboratory conditions; (2) Variations in the geometry of the fatigue crack as it develops may make it difficult to develop with rail flaw detectors. [Russian]

Translated in draft form.

Kolotushkin, SA Poroshin, VL  
USSR Ministry of Railways No Date, pp 45-47, 2 Fig., 3 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

01 142602

**USING ULTRASONICS TO CHECK RAILS TAKEN FROM THE TRACK [Proverka ul'trazvukom sniatykh s puti rel'sov]**

Growing freight traffic density and higher axle loads and train speeds have increased rail shelling, chips, diagonal cracks and transverse fatigue cracks in rails; these now account for 70 to 84 percent of all rail head defects. Before such rails are used for relay purposes or for welding, rail head defects must be detected. This article discusses the advantages and shortcomings of existing and newly developed ultrasonic probes which may be used after rail has been removed from track for possible reuse. The standard equipment and procedure are described. [Russian]

Translated in draft form.

D'iakonov, VN Kolotushkin, SA  
USSR Ministry of Railways No Date, pp 32-33, 4 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

01 142627

**CONRAIL REHABILITATION: A TREMENDOUS JOB, WELL BEGUN**

The 5 billion property rehabilitation of Consolidated Rail Corp., successor of seven northeastern bankrupts, is proceeding. From its start-up in April 1976 to year end, this railroad's program called for laying of 700 miles of continuous welded rail out of 35,000 miles total and insertion of 4.2 million cross-ties. Simultaneously 8,300 miles of track were to be surfaced and extensive work was to be performed on bridges, tunnels and on controlling vegetation. This pace is to continue for several years with the goal of permitting 70-mph operating speeds on lines handling upwards of 20 million

gross tons per year and 30 mph on all but yard tracks. Conrail has developed a computer program for appraising the cost effectiveness of work on each track segment based on discounted cash flow analysis and on additional analyses involving rate-of-return, safety, traffic density and service quality.

*Railway Age* Nov. 1976, pp 18-23

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01 142950

**HOW AUTOMATED TRACK LINING AND RAISING SYSTEMS WORK. 3--THE FAIRMONT SYSTEM**

This installment of a series describes the Fairmont system used for detecting errors in line and surface and for converting this information into signals that govern the raising and lining devices on production track maintenance machines. The three-point reference system for aligning both tangent and curved track serves as a guide for the operator who actually controls the machine.

Part 3 of a three-article series; see also Part 1, RRIS 01 141121, and Part 2, RRIS 01 141564, Bulletin 7701.

Collins, CG (Fairmont Railway Motors, Incorporated) *Railway Track and Structures* Vol. 72 No. 10, Oct. 1976, pp 28-30, 3 Fig.

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01 142952

**NEW LOOK AT TRACK PRACTICES, RESEARCH IN SOVIET UNION**

This is a report of the U.S. delegation inspection of the USSR Railways in June 1976 and includes visits to the Ministry of Railways, rail research groups, the test facility at Shcherbinka, a track buckling test facility and metallurgical laboratories, as well as on-line inspections. The economic justification of track projects, the conservative welded rail practices with buffer rails, the incidence of defects under traffic loads, the use of track panels, and the field welding practices are all discussed.

Beck, RF *Railway Track and Structures* Vol. 72 No. 10, Oct. 1976, 6 pp, 7 Phot.

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01 142953

**ENGINEERING A 200 KM/H LINE**

The three-stage plan for upgrading the East Coast mainline of British Rail is detailed. The goal is operation of 200 km/hr passenger trains over this 630 km route between London and Edinburgh. Three tables spell out the costs and minutes saved for incremental improvements along this route. Changes include new curve alignment, elimination of switches and crossovers, grade separation of highways, station remodeling, signaling changes and rebuilding of tunnels and bridges.

Ormiston, H (British Railways Board) *Railway Engineer* Vol. 1 No. 5, Sept. 1976, pp 14-20, 8 Fig., 6 Tab.

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

01 144011

**SUBSURFACE EXPLORATION METHODS FOR SOFT GROUND RAPID TRANSIT TUNNELS. 2 VOLUMES**

No Abstract.

Set includes PB-258343 thru PB-258344.

Parsons, Brinckerhoff, Quade and Douglas, Inc, Soil and Rock Instrumentation, Incorporated, Transportation Systems Center Apr. 1976, 247 pp

ACKNOWLEDGMENT: NTIS

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PB-259342-SET/ST, DOTL NTIS

01 144012

**SUBSURFACE EXPLORATION METHODS FOR SOFT GROUND RAPID TRANSIT TUNNELS. VOLUME I: SECTIONS 1-6 AND REFERENCES**

The objectives of the Urban Mass Transportation Administration (UMTA) Tunneling Program are to lower subway construction costs and reduce construction hazards and damage to the environment. Some measure of each of these objectives for bored tunnels and deep excavations can be achieved through a more detailed knowledge of the subsurface and of how changes in soil types or characteristics will affect construction. This study assesses subsurface exploration methods with respect to their ability to provide adequate data for the construction of rapid transit, soft-ground bored and cut-and-cover tunnels.

Prepared in cooperation with Soil and Rock Instrumentation, Inc., Newton Upper Falls, Mass. Also available in set of 2 reports as PB-258342-SET.

Schmidt, B Matarazzi, B Dunicliff, CJ Alsup, S Parsons, Brinckerhoff, Quade and Douglas, Inc, Soil and Rock Instrumentation, Incorporated, Transportation Systems Center, Urban Mass Transportation Administration Final Rpt. DOT-TSC-UM-TA-76-3.1, Apr. 1976, 203 pp

Contract DOT-TSC-654

ACKNOWLEDGMENT: NTIS  
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PB-258343/3ST, DOTL NTIS

01 144013

**SUBSURFACE EXPLORATION METHODS FOR SOFT GROUND RAPID TRANSIT TUNNELS. VOLUME II: APPENDIXES A-F**

This study assesses subsurface exploration methods with respect to their ability to provide adequate data for the construction of rapid transit, soft-ground bored and cut-and-cover tunnels. Geophysical and other exploration tools not now widely used in urban underground construction are investigated, their potential is discussed, and performance specifications and ideas for future development are presented. The effect of geotechnical variations on construction costs is modeled, and the effect of the prior knowledge of variation, including preliminary designs, specifications, cost estimates, and development plans, are formulated. Volume Two contains Appendixes A-F.

Prepared in cooperation with Soil and Rock Instrumentation, Inc., Newton Upper Falls, Mass. Also available in set of 2 reports as PB-258342-SET.

Schmidt, B Matarazzi, B Dunicliff, CJ Alsup, S Parsons, Brinckerhoff, Quade and Douglas, Inc, Soil and Rock Instrumentation, Incorporated, Transportation Systems Center, Urban Mass Transportation Administration Final Rpt. DOT-TSC-UM-TA-76-3.2, Apr. 1976, 144 pp

Contract DOT-TSC-654

ACKNOWLEDGMENT: NTIS  
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PB-258344/1ST, DOTL NTIS

01 144059

**THE RAIL AS A BEAM ON A STIFFENING ELASTIC FOUNDATION**

Conventional theory of rail track design is based on the assumption of a beam on a continuous linear elastic support. The presence of sleeper voids introduces a non-linear track load deflection response which is particularly pronounced on systems carrying 30 ton axle loads. An analysis has been conducted to compare the predicted rail stresses assuming a linear modulus derived from the load-deflection response with those obtained if a bi-linear analysis is adopted.

Mair, RI *Rail International* Vol. 7 N Aug. 1976, pp 443-50, 2 Fig., 2 Tab., 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
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DOTL JC

01 144060

**TECHNICAL METHODS OF TRACK MAINTENANCE**

[Tehnologiceskie processy tekuscevo soderzaniya puti]

The Track Department of the USSR's Ministry of Communication Routes has drawn up a programme of preventive maintenance which will be carried out according to technical methods developed by the Routes District Offices. These methods will take local particularities into account and will follow the guidelines laid down in "Principles and techniques for carrying out major track maintenance work". The methods used will be confirmed by the Head of each District. [Russian]

Sarbatov, IT *Put' i Putevoye Khozyaistvo* No. 5, 1976, pp 12-17, 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novoryazanskaya ul., Dom 12, Moscow 288, USSR

01 144062

**DB DEVELOPS STANDARDS FOR TOMORROW'S TRACK**

DB track development is characterised by a trend towards higher speeds and heavier axle loads. Combined with higher train frequencies, this has resulted in a significant increase over the last 10 years in the stress and forces to which track is subject. Track requirements are particularly demanding on the main arteries, where 85% of all DB traffic is carried on 12,000 km of route.

Birmann, F *Railway Gazette International* Vol. 132 No. 1, Jan. 1976, pp 13-17, 5 Fig., 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: ESL

DOTL JC

01 144063

**TIMBER LIKELY TO REMAIN FIRST CHOICE FOR US SLEEPERS**

Limited experience of concrete sleepers in the US indicates that performance does not match that on European railways. With timber sleepers still half the price of concrete there is little economic justification for a change, but doubts over long-term supplies of suitable wood have promoted research into laminated and reconstituted sleepers as substitutes for solid timber.

*Railway Gazette International* Vol. 132 No. 1, Jan. 1976, pp 17-19, 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: ESL

DOTL JC

01 144083

**INFORMATION AVAILABLE ON ESTIMATED COSTS TO REHABILITATE THE NATION'S RAILROAD TRACK AND A SUMMARY OF FEDERAL ASSISTANCE TO THE INDUSTRY**

Although there are several existing studies of the condition of railroad trackage, none is comprehensive enough to be a valid measure of conditions across the country. For the past 5 years about three-fourths of the Federal funds for aiding railroads went for emergency assistance to bankrupt carriers. There appears to be little assurance as yet that future Federal financial railroad assistance will be provided where needed, when needed, or in the amounts needed. Research and development projects of the Federal Railroad Administration are increasingly addressing current technological, economic, and management problems of the railroad system.

Comptroller General of the United States RED-76-44, No Date, 53 pp, 2 App.

ACKNOWLEDGMENT: Comptroller General of the United States  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

01 144446

**TECHNOLOGICAL PROCESSES OF PANEL TRACK REPAIR**

[Tekhnologicheskie protsessy remonta zven'evogo puti]

This set of instructions spells out the standard procedures for the rebuilding of track using welded rails on concrete cross ties, using jointed rail on wooden cross ties, substituting continuously welded rail for jointed rail, using track panels, and for routine maintenance of all these types of track. A total of 27 procedures are described. [Russian]

Table of Contents and Abstract are available in English, original text



untranslated as of December 1976.  
USSR Ministry of Railways No Date, 448 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

01 144447

**A COMPARATIVE TECHNICAL-ECONOMIC CHARACTERIZATION OF TRACKS WITH REINFORCED-CONCRETE TIES AND THOSE WITH WOODEN TIES [Sravnitel'naya tekhnico-ekonomicheskaya kharakteristika puti s zhelezobetonnymi i dereviannymi shpalami]**

The use of reinforced-concrete ties on Soviet railroads favors the solution of an important national economic problem, the curtailment of the consumption of high-quality construction lumber. Experience gained in the operation of rail lines with reinforced-concrete ties has confirmed that the type now in use in the Soviet Union (prestressed, monoblock, piano-wire-reinforced concrete) in the majority of cases is of quite high strength and longevity. Tendency to damage and instances of removal from service are relatively low. Life of 2 to 3 times that of wooden ties is achieved. Another important advantage of concrete ties is their great resistance to shifting of the rail-tie system on the ballast; this facilitates the use of welded rails without seasonal stresses. However, the present high rigidity of tracks with reinforced-concrete ties does actually worsen interaction between train and track. [Russian]

Complete translation is available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

All-Union Labor Red Banner Railway Research Inst No Date, 2 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

01 144448

**TECHNICAL SPECIFICATIONS FOR LAYING AND MAINTAINING CONTINUOUSLY WELDED RAIL [Tekhnicheskie usloviya na ukladku i sodержanie besstykovogo puti]**

This technical specification supersedes the 1962 standard and was developed by the head of the track directorate, the technical research organizations and the railways. It has been approved by the Commission on Track Maintenance of the Scientific-Technical Council of the Ministry of Railways. It has five sections: Fundamentals; Peculiarities of Welded Rail Design; Procedures for Laying Continuously Welded Rail; Maintenance and Repair of Continuously Welded Rail; Appendices. [Russian]

Table of Contents and abstract are available in English, original text untranslated as of December 1976.

USSR Ministry of Railways 1970, 120 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

01 144449

**THERMALLY HARDENED RAILS [Termicheski uprochnennye rel'sy]**

The technology of thermally hardened rails is discussed in 10 chapters: Rail Work Conditions and Operational Requirements; Requirements of Thermally Hardened Rails: Design Rigidity of Rails; Increasing the Strength of Rails; The Metallurgy and Capacity of Rails; Selection of Optimal Chemical Composition of Rail Steel; Thermal Hardening of the Entire Lengths of Rails; Properties of Thermally Hardened Rails; Peculiarities of the Operation of Thermally Hardened Rails; Welding Thermally Hardened Rails; Perspectives on the Further Increase of Rail Rigidity. [Russian]

Table of Contents only is available in English, original text untranslated as of December 1976.

Transport Publishing House 1976

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

01 144450

**A TECHNICAL DESCRIPTION OF THE TRACK RAISING, TAMPING AND DRESSING MACHINE VPO-3000 [Informatsiia po tekhnicheskomu opisaniiu vypravochno podbivochno-otdelochnoi mashiny VPO-3000]**

The high-efficiency, continuous-operation VPO-3000 machine is designed for integrated one-pass, smoothing, tamping and finishing in all kinds of track maintenance, and in building of new track. It performs simultaneously leveling on the longitudinal profile and on the plane, and also the packing on the slopes. Its functions are based on a continuous vibrational compression of the broken stone, gravel or sand ballast section. Production efficiency is 3000 meters per hour. The machine is operated by a team of eight workers. It is composed of a feed-control apparatus, an electromagnetic lifting mechanism which shifts the track assembly into the desired position. Rail brushes with spring-equipped plows clean the rails. Vibrational compressors, planers of slopes, and a 200-KW, 380-V electric power station, feeding all the motors, on board of the machine, complete the equipment. The VPO-3000 machine is driven by a Diesel locomotive. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

All-Union Labor Red Banner Railway Research Inst 1975, 6 pp, 1 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

01 144452

**POWER-DRIVEN RAIL-WELDING MACHINE PRSM-3. DESCRIPTION AND SPECIFICATIONS [Putevaia rel'sosvarochnaya smokhodnaya mashina PRSM-3. Opisanie i Tekhnicheskaya kharakteristika]**

The machine is intended for contact-welding rails of the R43, R50, R65 and R75 types, in a 1520 mm gauge railroad track. Continuous flash-welding with programmed control is used. The machine rests on two four-wheel trailer bogies. The drive consists of four electric traction motors. In the front of the machine are placed two gantry rockers with two jointed cantilever beams, from which electrically operated compound pulleys with welding heads are suspended. An electric 200-KW, 380-V, and 50-Hz A-C power station, located on the machine, feeds the D-C motors through a rectifier. The machine is equipped with automatic pneumatic brakes, and can be either self-driven or handled as a part of a train. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Ministry of Transport 1976, 7 pp, 2 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

01 144453

**PRESTRESSED REINFORCED CONCRETE CROSSTIES FOR WIDE-GAUGE RAILROADS. GOST 10629-71, OFFICIAL PUBLICATION [Shpaly zhelezobetonnnye predvaritel'no napriazhennye dlia zheleznykh dorog shirokoi kolei. Gost 10629-71 izdanie ofitsial'noe]**

The Standard deals with squared, prestressed, reinforced concrete crossties for wide-gauge railroads, standard rolling stock, rails of the P50, R65, and R75 types, and for intermediate rail fastenings of the KB and ZhB types, on straight and curved track sections (with a radius not less than 350 m). The shapes, basic dimensions and types of crossties have to conform to drawings on Table 1. There are two sorts of ties, I and II, according to their quality. Admissible deviations from standard dimensions are given in Table 2. The sloping of the under-tie area has to be 1/20 (within limits for tie I of 1/19 to 1/20, and for tie II of 1/19 to 1/22). Technical specifications and GOST requirements for various types of aggregate, the quality of Portland cement, mechanical stresses in ties, and all construction equipment are described. Acceptance rules and testing methods are described, as well as transportation, marking and storing methods. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Council of Ministers 1971, 14 pp, 8 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR



01 144454

**TIMBER CROSSTIES FOR WIDE-GAUGE RAILROADS GOST 78-65, GROUP K23-OFFICIAL PUBLICATION [Shapaly dereviannye dlia zheleznikh dorog shirokoi kolei GOST 78-65 Gruppya K-23 izdanie ofitsial'noe]**

Three types of wooden crossties for wide gauge railroads are produced, depending on their designation: I-for main tracks; II-for station and approach tracks; III-for lightly used tracks of industrial enterprises. According to cross-section configuration, crossties are of two types: A (trimmed)-cut on four sides; B (non-trimmed)-cut on two opposite sides only. Their dimensions are given in Table 1. The moisture content should not exceed 22% abs. The length of crossties has to be 2750 mm. They are made from the following woods: pine, spruce, fir, larch, cedar, beech and birch. Technical specifications are given in tabular form. The quality of impregnation has to satisfy requirements of GOST 5430-50. Inspection, marking, transportation and storage procedures are described. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Council of Ministers 1965, 7 pp, 2 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmanniy Tupik, 6a, Moscow B-174, USSR

01 144459

**STUDIES CONDUCTED BY TS,N.I.I. (CENTRAL SCIENTIFIC RESEARCH INSTITUTE) FOR IMPROVING THE RELIABILITY OF RAILS [Raboty, provodimye v Ts.N.I.I. po povysheniiv nadezhnosti zheleznodorozhnykh rel'sov]**

To assure the integrity of track structures, thermal rail hardening has become standard practice on USSR railways. Additional work is now being conducted in improving rail steel metallurgy, on countering the effects of wheel/rail contact forces and on rail designs. In addition to these efforts, the Ministry of Transport, Department of Rail Economy, has prepared specifications on other components intended to improve the reliability of the track structure. There follows a listing of 39 State Standards for rail ballast, crossties, rail fasteners, rail joints, switch points, frogs, and wood preservatives. [Russian]

Complete translation is available.

All-Union Labor Red Banner Railway Research Inst No Date, 4 pp, 1 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmanniy Tupik, 6a, Moscow B-174, USSR

01 144461

**FLAW DETECTION IN RAILS [Defektoskopiiia v rel'sov]**

The physical principles and techniques of magnetic and ultrasonic flaw detection in rails are given. The intended use, working principles, layout of various rail flaw detector systems, and the procedure for working with them are described. The methodology of rail inspections, both in the field and at railwelding facilities, is also described. The repair of flaw detection equipment on the railroads is examined. The book has been approved by the Chief Administration of Educational Institutions of the MPS (Ministry of Transportation) as a textbook for rail transportation technical schools and by the Academic Council of the State Committee of the U.S.S.R., Council of Ministers responsible for professional-technological education, as a manual for individual and brigade study by production workers. It will be helpful to maintenance- of-way workers involved in the inspection of rails. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

Gurvich, AK

Transport Publishing House Sept. 1975, 246 Fig., 19 Tab., 16 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmanniy Tupik, 6a, Moscow B-174, USSR

01 144462

**RAILROAD TRACK [Zheleznodorozhnyi Put]**

This book describes the arrangement of railroad track, its roadbed and superstructure, designation and design of track elements: the ballast layer,

rails, ties, rail fasteners, switches; set forth are the peculiarities of track arrangement on bridges and in tunnels; described are the interconnection and interaction of track and rolling stock, connection and intersection of tracks; set forth are technical specifications and norms for track maintenance and their basis. The book has been approved by the main administration educational institutions of the Ministry of Railroads in the capacity of a textbook for technical schools of railroad transportation and can be used as a manual for track-maintainers and builders. [Russian]

Table of Contents only is available in English, original untranslated as of December 1976.

Tchernyshev, MA

Transport Publishing House 1974, 347 pp, Refs.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmanniy Tupik, 6a, Moscow B-174, USSR

01 144463

**OPERATIONAL RELIABILITY AND TECHNOLOGY OF CONCRETE TIE MANUFACTURING [Ekspluatatsionnaia nadezhnost'i sovershenstvovanie tekhnologii izgotovleniia zhelezobetonnykh shpal]**

The book reviews breakage and flaws of concrete ties, as well as measures for their prevention: an analysis is given of domestic and foreign experience for the manufacturing of concrete ties and their service life. Recommendations are included on the improvement of factory tie production on the basis of the study of tie defects and technological techniques used in their production. Problems of tie manufacturing automation are dealt with. The book is intended for technical engineering workers of track maintenance, as well as technical engineering personnel of plants for concrete structures and design organizations. [Russian]

Table of Contents only is available in English, original untranslated as of December 1976.

Ivanov, GS

Transport Publishing House 1974, 158 pp, Refs.

ORDER FROM: Transport Publishing House Basmanniy Tupik, 6a, Moscow B-174, USSR

01 144465

**TECHNOLOGICAL PROCESSES OF THE REPAIR OF CONTINUOUSLY WELDED RAIL ON CONCRETE TIES [Tekhnologicheskie protessy remonta besstykovogo puti na zkelezobetonnykh shpalakh]**

This set of instructions spells out the standard procedures for the maintenance of track consisting of continuously welded rail on concrete cross ties. It describes 17 types of maintenance involving undercutting, ballast cleaning, track raising, track lining and complete renewal. The renewal process, utilizing prefabricated track panels, is described. [Russian]

Table of Contents only is available in English, original untranslated as of December 1976.

Transport Publishing House 1973, 314 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmanniy Tupik, 6a, Moscow B-174, USSR

01 144466

**TRACK AND TRACK MAINTENANCE [Put'i putevye khoziastvo]**

The book presents the bases of railroad track arrangement and performance of track maintenance. Described are the designs of track superstructure and substructure, connections and intersections of tracks; set forth are the calculation and design of the rail gauge, the calculations of the basic designs of railroad track; it publishes information on the organization and mechanization of the maintenance and repair of track. Approved by the main administration educational institutions of the Ministry of Railroads in the capacity of a textbook for students of higher educational institutions of railroad transportation and can be used as a manual for track technical engineer workers. [Russian]

Table of Contents only is available in English, original untranslated as of December 1976.

Amelin, SV Danovskii, LM

Transport Publishing House 1972, 209 pp, Refs.

## ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

01 144467

**CRUSHED STONE FOR RAILWAY BALLAST GOST 7392-70. OFFICIAL PUBLICATION [Shcheben'iz estestvennogo kamnia dlia ballastnogo sloia 751B under one cover in the original text. Abstract only]**

The Standard deals with gravel from natural stone, obtained by crushing rock for ballast in railroad tracks. Gravel has to be used in accordance with active standards, rules (SN and P), and the "Conclusions on conducting planned-and-preventive maintenance of the upper track structure, earthen roadbed and artificial structures of USSR railroads." The gravel is classified depending on the size of grains into groups, which should correspond to data on Table 1. Technical requirements are enumerated, and rules of inspection and of tests are described. The gravel grains can have dimensions from 5 to 25 mm. Number of grains with dimensions of 25 to 40 mm cannot exceed 5%, grains with dimensions of less than 5 mm cannot exceed 5%, and particles of less than 0.1 mm in size cannot exceed 2% of the total mass of gravel. According to indexes of mechanical strength, obtained in impact resistance tests, gravel is classified as marks U-75; U-50; and U-40. Water absorption should not exceed 1.5% of the mass. Rules of acceptance and methods of testing are described. [Russian]

State Standards Nos. GOST 7392-70, 7394-70, 7395-70 are all under one cover. Abstract only is available in English, is available in English, original untranslated as of December 1976.

USSR Council of Ministers for Constr Matters 1970, 10 pp, 1 Fig., 5 Tab.

## ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Council of Ministers for Constr Matters Moscow, USSR

01 144470

**TECHNICAL CONDITIONS, ASBESTOS BALLAST FOR RAILROAD TRACK TU-32TSP-254-72 (REPLACING THE TEMPORARY TECHNICAL CONDITIONS FROM 1963) EFFECTIVE 1/1/1973 [Asbestovyi ballast dlia zheleznodorozhnogo puti. Tekhnicheskie usloviia TU-32Ts.P.-254-72 (Vzamen vremennykh Tu ot 1973g) Srok vvedeniia s 1/1/1973g]**

The Standard deals with the tailings of asbestos production in the Bazhenovsk and Dzhetygarinsk asbestos deposits, which contain small amounts of certain minerals and of free unsorted fibers of chrysotile asbestos. These tailings are called asbestos ballast. This type of ballast is comparable with broken stone ballast in conformity with the standards and rules (SN and P). Asbestos ballast is applicable for railroad tracks if it contains grains of various dimensions from 25 to 0.1 mm (Table 1). Water absorption of sepiantinite in asbestos ballast should not exceed 1.5% of the total mass. The ballast should be free of clayey pieces, soil and other admixtures. Percentage contents of grains of various dimensions are calculated. Water absorption and frostproof quality are determined according to GOST 8269-64. Acceptance procedures and testing methods as well as rules concerning transportation and storing are described. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Ministry of Railways 1973, 10 pp, 1 Fig., 2 Tab.

## ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmannya 2, Moscow B-174, USSR

01 144471

**SANDY AND GRAVEL-SANDY BALLAST FOR RAILROAD TRACK-GOST 32-2-72. OFFICIAL PUBLICATION [Peschanyi i graviino-peschanyi ballast dlia zheleznodorozhnogo puti GOST 32-2-72. Izdanie ofitsial'noe]**

The Standard deals with coarse natural sand, formed as result of natural disintegration of rock, and with sandy-gravel mixture, both being packed on railroad tracks as ballast. This type of ballast is used in accordance with actual standards and rules (SN and P), and the "Conclusions on conducting Planned-and-preventive maintenance of the upper structure, earthen roadbed, and artificial structures of railroad tracks of USSR." Table 1 presents the grain dimensions and their percentage contents suitable for using as

ballast. The amount of gravel grains and pebble of soft rock cannot exceed 15% of the total mass. The percentage contents in the ballast of grains of various sizes: over 100 mm; from 100 to 60 mm; from 60 to 3 mm; from 3 to 1 mm; from 1 to 0.5 mm; from 0.5 to 0.1 mm, and less than 0.1 mm-are calculated from different formulae. The contents of clayey particles in sand should not exceed 2%, and is usually calculated by the areometric method. The coefficient of permeability of the ballast is found using the instrument KF-00, which is produced by the plant "Nefteavtomatika". Rules of acceptance and testing methods, as well as transportation and storage procedures are described. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Ministry of Railways 1972, 10 pp, 2 Fig., 3 Tab.

## ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmannya 2, Moscow B-174, USSR

01 144472

**CRUSHED BOULDERS AND PEBBLES FOR RAILROAD BALLAST, GOST 7393-71. OFFICIAL PUBLICATION [Shcheben iz valunov i gal'ki dlia ballastnogo sloia zheleznodorozhnogo puti. GOST 7393-71. Izdanie ofitsial'noe]**

The Standard deals with gravel obtained from crushed boulder and pebbles. Its use is controlled by active standards (SN and P), and by the "Conclusions on conducting planned-and-preventive maintenance of the upper track structure, earthen roadbed, and artificial structures of USSR Railroads". The number of grains in the mass should not be less than 70% of the total. Depending on the indexes of mechanical strength, obtained in tests on the braker PM, gravel is classified as U-75; U-50; and U-40. According to indexes obtained in abrasion tests in a ball mill, gravel is classified as I-15; I-30; and I-40. Water absorption should not exceed 1.5% of dry gravel mass. The crushed stone should not contain any clay, vegetal layers, nor other impurities. Rules of acceptance, and testing methods are described. Transportation and storing of gravel are specified. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Council of Ministers for Constr Matters 1971, 8 pp, 1 Fig., 7 Tab.

## ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Council of Ministers for Constr Matters Moscow, USSR

01 145137

**ON THE STRESS ANALYSIS OF RAILS AND TIES**

This report covers first the methods presented in the literature for the stress analysis of railroad track components and results of a variety of validation tests. It was found that a formula can yield deflections and bending stresses in the rails of longitudinal-tie and cross-tie tracks which agree for design purposes with track test results if coefficients are properly chosen. This is followed by a review and discussion of the methods for determining these coefficients. The report concludes with recommended analyses and test methods for the determination of stresses in the rail-tie structure.

Kerr, AD (Princeton University) *AREA Bulletin* Vol. 78 No. 659, Sept. 1976, pp 19-43, 12 Fig., 65 Ref.

Contract DOT-TSC-900

ORDER FROM: AREA

DOTL JC

01 145603

**DOT TEST TRAIN PROGRAM SYSTEM INSTRUMENTATION MANUAL. SEVENTH EDITION**

The manual describes track measurement instrumentation which has been developed during the report period and covers all instrumentation currently installed aboard the FRA track survey cars. The major emphasis of this report deals with the operation and calibration of the track geometry measurement system installed aboard track survey car T-3. Ancillary systems as well as equipment aboard track survey car T-1 are also summarized. The information is intended for use by technical personnel concerned with the utilization of FRA track survey car instrumentation, and by engineering and research personnel involved in the application of track geometry measurement techniques.

See also PB-250776.  
Gunn, WW  
ENSCO, Incorporated, Federal Railroad Administration Ann. Rpt.  
DOT-FR-76-01, FRA-OR&D-76-254, June 1976, 149 pp

Contract DOT-FR-20032

ACKNOWLEDGMENT: NTIS, FRA  
ORDER FROM: NTIS

PB-258497/7ST, DOTL NTIS, DOTL RP

**01 147574**  
**THE EFFECT OF IMPERFECTIONS ON THE VERTICAL**  
**BUCKLING OF RAILROAD TRACKS**

This report deals with an analytical prediction of the effect of geometric imperfections on the post-buckling characteristics of railroad tracks. The analysis is restricted to the case of vertical track buckling due to constrained thermal expansion in which the track is assumed to lift itself up over a finite span. The imperfections are categorized into two cases. Case (A) in which the region of imperfection is larger than the span of lift-off and Case (B) in which the imperfection region is smaller than the span of lift-off. It is shown that while a perfectly straight track does not exhibit bifurcation points from the undeformed state, the imperfect track does and that the bifurcation temperature in Case (A) is lower than in Case (B) for the same ratio of imperfection amplitudes reduces the bifurcation temperatures significantly. It is found that the bifurcation temperature as well as the safe temperature increase are higher for heavier tracks.

Research sponsored by the Federal Railway Administration, Office of Research and Development, under contract to the Transportation Systems Center, Cambridge, Massachusetts.

El-Aini, YM  
Princeton University, (DOT-TSC-FRA-75-17) Intrm Rpt. FRA-OR&D-76-09, June 1976, 42 pp, 10 Fig., 1 Tab., 9 Ref., 1 App.

Contract DOT-TSC-900

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-259389/AS, DOTL NTIS

**01 147586**  
**A NOTEWORTHY FRENCH RAILWAY ACHIEVEMENT**  
**ABROAD: LAYING AN 860-KM MINE RAILWAY IN SOUTH**  
**AFRICA [Une belle realisation technique francaise a l'etranger: la pose**  
**d'une voie miniere de 860-km en Afrique du Sud]**

Two French companies "SPIE Batignolles" and "Desquenne and Giral", in association with the South African Vredenburg Company, have just completed the laying of a 1.065 m gauge iron-ore railway line from Sishen to the port of Saldanbra over a distance of 860-km. After briefly describing the line, the author gives details of the method chosen to lay the permanent way at a speed never so far reached by employing advanced French techniques for the track, organization and advancement of the work sites. Work began in 1975 and was completed on 28 April 1976 at kilometre point 861.238, and the first trains were running on scheduled services by 12 May 1976. [French]

Huart, F *Revue Generale des Chemins de Fer* Oct. 1976, pp 595-605, 13 Phot.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

**01 147594**  
**C&NW GOES DEEP WITH LIME**

Chicago and North Western, when confronted with a perennial soft spot on its Des Moines--Kansas City line, finally resorted to lime slurry injection to stabilize the 1000-ft fill on 2-degree curves across a typical Iowa river bed. While the road had earlier used lime stabilization, it had never been at 40-ft depths. Soil sampling indicated clays which could be lime stabilized under the Iowa embankment. The equipment, drill pattern and quantities of lime used are described.

*Progressive Railroading* Vol. 19 No. 10, Oct. 1976, pp 44-45, 4 Phot.

ORDER FROM: Murphy-Richter Publishing Company 20 North Wacker Drive, Chicago, Illinois, 60606

DOTL JC

**01 147597**  
**FINITE ELEMENT TRACK STABILITY MODEL**

The objective of this report is to simulate track stability so that the buckling load of the track can be predicted. Thus, the criteria for track design, maintenance and evaluation, as far as track stability is concerned, can be formulated. The simulation is achieved by a finite element model. Only the basic applications and potential of the model are illustrated. The model predictions are compared with experimental data and mathematical models in literature. A parameter investigation is presented. The model is in reasonably good agreement with test data in literature and, compared with other mathematical models, it shows much more versatility and same or better accuracy. The parameter investigation indicates that the lateral thermal buckling load of a 200' (61 m) tangent test track is not significantly affected by quadrupling the track length or by changes in longitudinal ballast resistance, but is greatly affected by changes in lateral ballast resistance, misalignments, and the presence of ineffective ties.

So, W Martin, GC  
Association of American Railroads Technical Center, (Res. Project R-001)  
Res. Rpt.7 R-236, June 1976, 103 pp, 71 Fig., 3 Tab., 13 Ref.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

**01 147691**  
**DEVELOPMENT OF HIGH SPEED TRACK INSPECTION**

The High Speed Track Inspection Machine was developed on the basis of Japanese National Railways' experience with track maintenance of high-speed lines. The HISTIM supplements the conventional track inspection system based on the 10-m versine method; the new unit measures short wavelength irregularities which can produce resonance in the unsprung car components and track structure if not corrected. Measured are wheel load, lateral force, vertical and lateral journal box acceleration and the absolute shape of the vertical track irregularity. The system is undergoing refinement which is expected to simplify some of the measuring processes.

Sato, Y *Permanent Way* Vol. 16 No. 4, Nos. 61-62, July 1976, pp 41-50, 5 Fig., 1 Tab.

ORDER FROM: ESL

DOTL JC

**01 147692**  
**CONSTRUCTION WORK OF TRACKS**

The design, construction and track laying techniques used for the extension of the New Sanyo Line to Hakata are described. Much of the line is concrete slab track laid on mats with shorter segments of more conventional ballasted track. The procedures for track laying and for installation of the welded rail are described.

Takahara, S Kobayashi, S Morinishi, I Baba, K Tsujimoto, M  
*Permanent Way* Vol. 16 No. 4, Nos. 61-62, July 1976, pp 23-40, 4 Fig., 5 Tab.

ORDER FROM: ESL

DOTL JC

**01 147693**  
**TRACKS OF NEW SANYO LINE BETWEEN OKAYAMA AND**  
**HAKATA**

Standards for rail, track structures and track materials used for the 398-km extension of the New Sanyo Line to Hakata are described. Though not basically different from those used for the earlier high-speed lines, standards and structures take into account future operation at even higher speeds. Improvements also take into account 10 years of experience with maintenance of the older Shin Kansen. Concrete slab track, chosen for low maintenance requirements, is employed as the standard for about 70 per cent of the line. Slab track is seen as essential for future high speed lines, although measures will have to be taken to attenuate noise and vibration from such a track structure.

Isoura, K Yamaguchi, A *Permanent Way* Vol. 16 No. 4, Nos. 61-62, July 1976, pp 1-22, 18 Fig., 10 Tab., 8 Phot.

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01 147694

**INFRA-RED POINT HEATERS, USING PROPANE**

An extensive analysis is made of the use of propane-fired switch heaters on Swiss Federal Railways. The gas supply, heaters, remote control and automation of these installations are described; annual operating costs are also given.

Sandera, Z (Swiss Federal Railways) *Rail International* No. 10, Oct. 1976, pp 555-570, 23 Fig., 1 Tab.

ACKNOWLEDGMENT: Rail International  
ORDER FROM: ESL

DOTL JC

01 147695

**THE USE OF COMPUTER SIMULATION FOR THE SOLUTION OF TRACK DESIGN AND MAINTENANCE PROBLEMS**

Experiments in digital computer simulation of various track design and maintenance problems are described. The design of a symbolic model is illustrated by a complete case of computations carried out in order to determine track gauge deviations knowing the statistical dimensional parameters of its components. Further cases of a successful application of this technique are also quoted.

Baluch, H (Institute of Railway Research, Poland) *Rail International* No. 10, Oct. 1976, pp 546-554, 8 Fig., 1 Tab., 14 Ref.

ACKNOWLEDGMENT: Rail International  
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DOTL JC

01 147696

**THE SIGNIFICANCE OF THE RAIL LIFTING WAVE**

Track buckling, which may arise at high temperatures under a train, originates in the zone of the lifting wave of the rail developing before and behind a wheel set of a vehicle. The lifting wave is considerably influenced by the type of vehicle and the modulus of subgrade reaction of the permanent way. On the basis of a technical examination, it is shown that the lifting wave critical for the track bed stability and ballast stress may be reduced by increasing the weight of the track panel.

Eisenmann, J (Technical University of Munich, West Germany) *Rail International* No. 10, Oct. 1976, pp 576-581, 5 Fig., 1 Tab., 5 Ref.

ACKNOWLEDGMENT: Rail International  
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01 147715

**RAIL ANALYSIS. VOLUME 1: FRACTURE MECHANICS. FRACTURE MECHANICS OF RAILS WITH SHELL-INITIATED TRANSVERSE DEFECTS**

This report describes a fracture mechanics model for rail head transverse defects, specifically detail fractures from rail shell. The model is applied to calculate the failure strength of 71 rail segments which were rejected by inspection, removed, and tested through three-point bending by the Association of American Railroads. Utilizing the defect measurements for each rail, reasonable agreement is obtained between observed failure loads and failure loads calculated from the stress and fracture mechanics analysis. The fracture mechanics analysis is then extended to obtain preliminary estimates of the fatigue performance of defective rails in service. Specifically, the crack tip stress intensity factor is calculated for transverse defects under various types of in-service loading. The fracture mechanics solutions are utilized to conservatively calculate the remaining lifetime of the rail as a function of defect size and magnitude of wheel load. Calculations indicate that the shear stress reversal experienced as the wheel crosses a transverse crack is the dominant stress component causing fatigue crack propagation. Recommendations are made for additional analytical developments and experimental results required to refine the fatigue life predictions and incorporate them into programs for risk assessment and reliability optimization.

This document is the first in a series describing research in Phase 2 of the Train Track Dynamics Program, a cooperative program of the AAR, FRA, RPI and Canadian Transportation Development Agency.

Besuner, PS

Failure Analysis Associates Tech. Rpt. R-225, Oct. 1976, 135 pp, 23 Fig., 3 Tab., 31 Ref., 2 App.

Contract FAA-75-1-1(B)

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

01 147891

**THE NEW 725/726 TRACK RECORDING RAILCAR**

The new two-unit 725/726 track-recording railcar was developed from the standard 701 tower wagon rebuilt as a 726 recorder unit together with a converted 798 rail bus serving as traction unit and accommodation car. The DB now has five such track-recording units, which are stationed at Augsburg, Hanau, Hanover, Nurnberg and Opladen. It is hoped at some later date to publish an article describing the entire recording equipment. [German]

Kottenhahn, V *Eisenbahntechnische Rundschau* Vol. 25 No. 7/8, July 1976, 6 pp

ACKNOWLEDGMENT: British Railways

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

01 147897

**CNR STARTS PROGRAM TO INSTALL CONCRETE TIES ON SHARPER CURVES**

Based on the stability and low maintenance requirements of a test section on concrete-tie track near Jasper, Alta., over four years, Canadian National has undertaken the replacement of wooden ties out-of-face with prestressed concrete cross ties and the existing jointed rail is being replaced with CWR. Installation procedure involves use of special types of equipment imported from Europe. Total of 1.5 million concrete ties will be installed over five-year period.

*Railway Track and Structures* Vol. 72 No. 12, Dec. 1976, pp 14-16, 5 Phot.

ORDER FROM: ESL

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01 148272

**DEVELOPMENT OF A STRUCTURAL MODEL AND MATERIALS EVALUATION PROCEDURES-BALLAST AND FOUNDATION MATERIALS RESEARCH PROGRAM**

An adequate engineering analysis of conventional railway track support system (CRTSS) requires the consideration of all the major components of the track support system. Past efforts in this area have not been satisfactory because of lack of proper material characterization and very simplified modelling of the CRTSS. An attempt has been made to model the CRTSS using the finite element method that would allow a determination of the transient response of the CRTSS by incorporating proper material characterization. Because of the complex three-dimensional geometry, the analytical modelling was divided into two stages; namely, a longitudinal analysis stage and a transverse analysis stage. Stress dependent material properties of the ballast, the subballast, and the subgrade can be used with the finite element method. The finite element model has been validated using the measured response at Section 9 of the Kansas Test Track. Good agreement was obtained between the measured response and that calculated using the finite element model. The report also describes ballast and subgrade materials evaluation procedures. The repeated load triaxial testing procedure that has been selected for evaluating the resilient and permanent deformation characteristics of ballast and subgrade soil materials is described in detail.

Research sponsored by the Federal Railroad Administration, DOT, and the Association of American Railroads.

Robnett, QL Thompson, MR Knutson, RM Tayabji, SD  
Illinois University, Urbana Final Rpt. FRA-OR&D-76-255, Nov. 1975, 97 pp, 35 Fig., 6 Tab., 57 Ref.

Contract DOT-FR-30038  
 ACKNOWLEDGMENT: FRA  
 ORDER FROM: NTIS

DOTL NTIS, DOTL RP

01 148273

**TRACK SUPPORT SYSTEMS PARAMETER STUDY-BALLAST  
 AND FOUNDATION MATERIALS RESEARCH PROGRAM**

A finite element structural analysis model for conventional railway track support systems (CRTSS) has previously been developed. This study includes parameter studies and sensitivity analyses conducted using the structural model to establish the effects of various parameters on the "instantaneous-elastic" response of CRTSS. The parameters studied are ballast (type and depth), subballast (type and depth), subgrade support conditions, rail size, ties (spacing and width), wheel loading, missing ties and tie type. The parameter study indicates that ballast type and rail size do not significantly effect "instantaneous-elastic" response of CRTSS, while subballast (stabilized), subgrade support condition and wheel loading are some of the major parameters that affect the "instantaneous-elastic" response of the CRTSS.

Research sponsored by the Federal Railroad Administration, DOT, and the Association of American Railroads.

Tayabji, SD Thompson, MR  
 Illinois University, Urbana Final Rpt. FRA-OR&D-76-256, Mar. 1976,  
 71 pp, 18 Fig., 14 Tab., 6 Ref.

Contract DOT-FR-30038  
 ACKNOWLEDGMENT: FRA  
 ORDER FROM: NTIS

DOTL NTIS, DOTL RP

01 148274

**PROGRAM ILLI-TRACK: A FINITE ELEMENT ANALYSIS OF  
 CONVENTIONAL RAILWAY SUPPORT SYSTEM. USER'S  
 MANUAL AND PROGRAM LISTING**

A computer program for the finite element analysis of conventional railway track support systems has been developed. This report details a User's Manual and a Program Listing of the computer program.

Research sponsored by the Federal Railroad Administration, DOT, and the Association of American Railroads.

Tayabji, SD Thompson, MR  
 Illinois University, Urbana Final Rpt. FRA-OR&D-76-257, Mar. 1976,  
 101 pp, 7 Fig., 3 Ref.

Contract DOT-FR-30038  
 ACKNOWLEDGMENT: FRA  
 ORDER FROM: NTIS

PB-262988/AS, DOTL NTIS, DOTL RP

02 052904

**FORM AND STRUCTURE OF CONCRETE SLEEPERS, IN RELATION TO THE LOADS TO BE SUPPORTED IN SERVICE. PROGRESS REPORT**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D22/CR 1/E, Mar. 1958, 23 pp

ACKNOWLEDGMENT: UIC

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02 052905

**TECHNICAL AND ECONOMICAL STUDY OF TESTED TYPES OF CONCRETE SLEEPERS**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D22/RP 2/E, Apr. 1961, Apps.

ACKNOWLEDGMENT: UIC

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02 052935

**CONSTRUCTIONAL ARRANGEMENTS FOR IMPROVING THE RIDING STABILITY AND THE GUIDING QUALITY OF ELECTRIC AND DIESEL LOCOMOTIVES AND VEHICLES. RESULTS OF THE MEASUREMENTS MADE ON THE LOCOMOTIVES E 424.065 AND E 646.014 OF THE ITALIAN STATE RAILWAYS (FS). (TEXT AND ENCLOSURES 1-125)**

For the purpose of investigating the riding stability the B 10 Specialists Committee selected locomotives of the FS series E 424 (BoBo) and E 646 (BoBoBo) because both types of locomotives were equipped with bogies the fundamental design of which was very similar. A characteristic feature of this bogie design was the play of the axle boxes (Zara design), sole use of laminated springs for the support of the body and also an elastic suspension of the body in the transverse direction which has been achieved by means of a centering of the bolster swing links. The motors were suspended in the bogies and equipped with quill drive, while the six-axled types of locomotives had been fitted twin motors. This made a comparison of the running gear arrangements BoBo and BoBoBo possible and, in addition, provided a basis for comparing the BoBoBo locomotive with six-axled locomotives, particularly those of the CoCo arrangement, which were to be investigated at some future data. For the purpose of assessing the riding stability of the two locomotive types the H-forces were chosen as the decisive criterion, as it had been done during the previous investigations on locomotives (see B 10 Interim Report RP 1, RP 2 and RP 3).

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B10/RP 7/E, July 1961, 36 pp, 125 App.

ACKNOWLEDGMENT: UIC

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02 052936

**CONSTRUCTIONAL ARRANGEMENTS FOR IMPROVING THE RIDING STABILITY AND THE GUIDING QUALITY OF ELECTRIC AND DIESEL LOCOMOTIVES AND VEHICLES. MEASUREMENTS RELATING TO THE LOCOMOTIVES E 424.065 AND E 646.014 OF THE ITALIAN STATE RAILWAYS (FS)**

During the last few years methods have been developed for measuring the guiding forces exerted by the vehicles upon the track, in particular, the Y-forces; these can be measured on the rail itself and also directly on the wheels of the vehicles. The B 10 Specialists Committee has already used these methods of measurement and the results of the tests made so far were published in Interim Reports Nos. 4, 5 and 6. The present report gives a comparison between the H-forces on a Bo'Bo' locomotive and on a Bo'Bo'Bo' locomotive of the FS and the Y-forces, which were simultaneously

measured on a curved rail. This report shows that within the framework of these studies the Y-forces are more suitable for assessing the riding qualities of the vehicles than the H-force. The former especially gives a more accurate determination of the forces exerted by the vehicles on the rails than has been possible by the measurement of the H-forces only. Besides, the values of the Y-forces also supply data on the so called "coefficient of friction" when sliding in the transverse direction, when the wheel loads were simultaneously measured with a sufficient degree of accuracy.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B10/RP 8/E, Oct. 1962, 19 pp, 63 App.

ACKNOWLEDGMENT: UIC

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02 052937

**CONSTRUCTIONAL ARRANGEMENTS FOR IMPROVING THE RIDING STABILITY AND THE GUIDING QUALITY OF ELECTRIC AND DIESEL LOCOMOTIVES AND VEHICLES. INVESTIGATION OF RIDING STABILITY OF THE ELECTRIC CO'CO' LOCOMOTIVE NO. 1010.01 OF THE AUSTRIAN FEDERAL RAILWAYS (ÖBB). (TEXT, TABLES AND FIGURES)**

Having obtained comprehensive results from the tests made to investigate the riding stability of some four-axled locomotives and one Bo'Bo'Bo' locomotive, Specialists Committee B 10 considered that the riding of Co'Co' locomotives should also be studied. The first locomotive with this wheel arrangement, which was selected for a complete investigation, was electric locomotive No. 1010.01 of the Austrian Federal Railways. The reasons for this were the pivotless bogies with which some locomotives of this series were equipped, an interesting linkage system performing the function of the pivot. The running gear of the Austrian 1010 class otherwise consisted of the classical elements, namely plain bearing axleboxes in axlebox guides, a tread contour of 1 : 20/1 : 10 and a suspension which, mathematically, absorbed 7% of the static load with helical springs and 93% with leaf springs. Centering of horizontal displacements in the transverse direction between bogie and body was effected by longitudinal links of 975 mm in length, and rubber springs. The locomotive was tested with three variants of the transverse coupling (between body and bogie): in the standard arrangement, i.e. with longitudinal links and rubber buffers, hence referred to as "rubber buffers in the bolster", with centring effected only by the longitudinal links, denoted by designation "bolster free", and with rigid transverse coupling, the lateral play between body and bogie having been arrested, denoted by the designation "bolster blocked". The investigation of the riding stability was carried out by measuring Group L 4 of the Bundesbahnversuchsanstalt of the DB at Minden (Westphalia) Department for the investigation of the riding stability and vibrations.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B10/RP 9/E, June 1964, 24 pp, 82 Fig., 6 Tab.

ACKNOWLEDGMENT: UIC

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02 052938

**CONSTRUCTIONAL ARRANGEMENTS FOR IMPROVING THE RIDING STABILITY AND THE GUIDING QUALITY OF ELECTRIC AND DIESEL LOCOMOTIVES AND VEHICLES. A COMPARISON OF THE METHODS OF MEASURING ON THE TRACK AND ON WHEELS THE LATERAL FORCES (Y) AND VERTICAL LOADS (Q) CAUSED BY ROLLING STOCK TRAVELLING ROUND A CURVE AT VALLORBE, 1962. (TEXT AND APPENDICES)**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B10/RP 11/E, Oct. 1964, 53 pp, Figs., Tabs., 7 Ref., Apps.

ACKNOWLEDGMENT: UIC

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02 052942

**STUDY OF THE PROBLEM OF ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. REPORT OF INQUIRY**

Question B 44 envisages the study of the adhesion of locomotives from the point of view of their construction and operation. It was considered, however, that a satisfactory appraisal of the effect of the constructional features of locomotives on their performance from the adhesion point of view could not be logically considered in the absence of knowledge of the value of the true coefficient of adhesion and of the manner in which it varies with operational and climatic conditions. A questionnaire was therefore devised in order to reveal the views of administrations on these basic topics. This has been reproduced herewith as Appendix I. At the time of writing, replies have not been received from three Administrations who may be expected to have valuable information to impart. It is not therefore possible to prepare a final report and the present statement, must be regarded as an interim one. Nevertheless, it is hoped that the information obtained will be sufficient to enable the Control Committee to arrive at a decision, bearing in mind the probability that the further replies will have been received by the time the Committee meets.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B44/RP 1/E, Nov. 1960, 18 pp, 1 App.

ACKNOWLEDGMENT: UIC  
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02 052943

**STUDY OF THE PROBLEM OF ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. THE DEVELOPMENT OF SPARK CLEANING FOR IMPROVING LOCOMOTIVE ADHESION**

This report contains a description of the test carried out between Landres and Audun-le-Roman in France with the spark cleaning equipment developed by the Battelle Institute in conjunction with the SNCF and ORE. Slip risk curves were plotted for starting tests on an electric locomotive and at 5, 10, 15 and 20 km/hr. The results show that with the existing circuits the improvement in adhesion is negligible at 20 km/hr but appreciable on starting. They indicate that number of electrodes is insufficient to have much effect. That is to say the most polluted stretches of line are effectively cleaned when starting but at higher speed the number of electrodes is insufficient to have much effect. The second part of the report describes the circuits used and how they have been evolved. The effect of the sparking on the mechanical properties of the rail and on television reception will be the subject of further study.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B44/RP 3/E, June 1964, 13 pp, 12 Fig., 1 App.

ACKNOWLEDGMENT: UIC  
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02 052944

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. STATISTICAL METHODS IN THE STUDY OF LOCOMOTIVE ADHESION**

This report is intended as an introduction to the statistical methods used in evaluation of the Pontarlier- Frasné trials and described in Interim Report No. 2. The basic statistical quantities are defined and the method of assessing the validity of the difference of two means (Student's test) is described. An example of the analysis of variance involving two factors is worked out in detail as an introduction to the three factor and six factor analyses to be found in Interim Report No. 2 itself. An explanation is also given of the method of presentation of the results in Interim Report No. 3.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B44/RP 4/E, June 1965, 15 pp, 6 Fig.

ACKNOWLEDGMENT: UIC  
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02 052945

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. GENERAL REPORT ON THE DEVELOPMENT OF THE PRACTICAL APPLICATION OF SPARKING FOR IMPROVING LOCOMOTIVE ADHESION**

In 1956 the SNCF gave the Battelle Institute a research project, the object of which was the improvement of the adhesion between wheel and rail of electric locomotives. In 1962 when sparking had been found by the SNCF to be a promising method, research was continued by the International Union of Railways. The advancement of the work, and in particular the present stage, which has resulted in sparking by a single electrode necessitates a review of the whole project. The present report summarises briefly the different stages of the work, analyses the results achieved and shows various possibilities of practical application, and is a continuation of report RP 3.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B44/RP 5/E, Mar. 1966, 21 pp, 15 Fig.

ACKNOWLEDGMENT: UIC  
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02 052946

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. TESTS OF RAIL SPARKING TO IMPROVE ADHESION, CARRIED OUT ON BRITISH RAILWAYS**

The past work of Specialist Committee B 44 in the development of a method for improving adhesion by using an electric arc struck between an electrode on the vehicle and the wheel/rail has been published in report B 44/RP 3 and 5. Promising results were obtained on the short length of test track at the Battelle Institute, Geneva, and it was therefore decided to conduct more extensive tests on the running lines of an actual railway. Accordingly, in December 1966 and February 1967, comprehensive tests were carried out on the running lines of BR to confirm the results obtained in Geneva. The following features were examined: Improvement in adhesion on rails with various conditions of running surface-dry, wet, polluted, oiled- as a result of a number of successive sparking runs; The "memory effect", or persistence of the effect of sparking after a period of time; Noise generation by the device; Radio and television interference from the device; The effect of the arc on the material of the rail. The results of the tests confirmed those obtained earlier in Geneva and elsewhere. While the improvement in adhesion is satisfactory, the efficiency of the sparking device is low and there are various undesirable side-effects. The Committee concludes that the development of other methods, such as the plasma gun, is more likely to lead to a successful practical method for improving adhesion.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B44/RP 6/E, Nov. 1967, 18 pp, 22 Fig., Apps.

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02 052947

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. USE OF SAND TO IMPROVE ADHESION**

As sanding is the oldest and most widely-used method of improving the coefficient of friction between wheel and rail, an examination was made of studies carried out recently by several railway administrations on aspects of sanding. A questionnaire was also prepared and sent to all the ORE member-administrations, to summarise current practice on the following



aspects: Quality and grain-size of sand used, Specifications of sand supplied to administrations, Treatment of sand, Handling of sand, Technical data on sanders used, and Rate of delivery of sand. From the information given, recommendations were made for obtaining the best results from the use of sand for increasing adhesion.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B44/RP 7/E, Apr. 1969, 15 pp, 8 Tab.

ACKNOWLEDGMENT: UIC  
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02 052948

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. EQUIPPING OF A TEST MACHINE WITH VARIABLE CONSTRUCTIONAL CHARACTERISTICS**

In the past work of the Specialists Committee B 44, adhesion tests were carried out using standard electric locomotives of the SNCF and CFF (see Report B 44/RP 2 published June 1964). Some useful results were obtained from these tests but it was apparent that if certain constructional characteristics of the locomotive could be varied at will, their influence on adhesion could be shown. This cannot be done with standard tractive units. The former gas turbine locomotive 18 000 of British Railways was offered to the Committee and has been rebuilt as a test machine for adhesion studies. This report describes the work which was carried out on the test machine and its measuring equipment. The test machine has the following features: 1) A single traction motor drives the centre axle of one three axled bogie. This motor can be fed either from electric or diesel electric locomotives to compare different current supply systems. 2) The loading on the single traction axle can be varied pneumatically. Driving wheels of different diameters and drive systems of different resiliences can be fitted. 3) The value of the coefficient of adhesion is obtained directly by comparison of the tractive effort with the vertical load on the wheelset. This latter is measured under dynamic running conditions. 4) Slip and micro slip can be monitored accurately. 5) Calculating and recording equipment deals with the magnitudes measured. Preliminary trials were carried out on the test machine in July and August 1969.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B44/RP 8/E, Oct. 1969, 45 pp, 37 Fig., Tab.

ACKNOWLEDGMENT: UIC  
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02 052949

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION. ADHESION TESTS BETWEEN WADGASSEN AND HARGARTEN. PRELIMINARY TESTS AND TESTS IN 1970**

In report B 44/RP 8, the Test Machine 180000, for adhesion studies, in which various basic constructional characteristics can be altered without affecting each other, was described. This Report describes two series of tests carried out on the test machine: Preliminary tests carried out in July and August 1969, between Wadgassen (DB) and Hargarten (SNCF), to check the operation of the test machine and the various measuring apparatus and, if necessary, to carry out certain modifications. They were also intended to allow the testing staff to gain experience in the operation of the different devices. The first series of adhesion tests were carried out in September and October 1970 on the same section of line. In these tests, the influence of the running speed and, in particular, the vertical axle load, on the adhesion coefficient were examined. Although only partial results have been obtained, it has nevertheless been considered useful to give them in this report. From them, a general tendency for the coefficient of adhesion to decrease with increasing speeds can be seen, which is not new, but also a decrease in the coefficient of adhesion with increasing axle loads can be seen. A further report will give the results obtained during a series of tests carried out in April and May 1971, during which more parameters were able to be examined and many more measurements were obtained and evaluated.

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International Union of Railways B44/RP 9/E, Oct. 1971, 52 pp, 77 Fig., 11 Tab.

ACKNOWLEDGMENT: UIC  
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02 052980

**STUDY OF A PLASMA TORCH FOR IMPROVING ADHESION. DESIGN AND CONSTRUCTION OF PLASMA TORCH EQUIPMENT**

In extensive laboratory and track trials the plasma torch has been demonstrated as a tool for improving wheel-rail adhesion at speeds up to 48 km/h. The plasma treatment was found to be effective under a wide range of climatic conditions with contaminants generally found on the British Railways network. These included oil, grease, diesel fuel, coal dust and fallen leaves. In view of this success, a vehicle, to be put into service on British Railways, has been designed and is now under construction. This will be used mainly on the coal haulage routes where low adhesion is frequently encountered. This plasma car will operate independently of the freight locomotives and will act as a rail conditioning vehicle.

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International Union of Railways B114/RP 1/E, Apr. 1970, 19 pp, 17 Fig.

ACKNOWLEDGMENT: UIC  
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02 052981

**STUDY OF A PLASMA TORCH FOR IMPROVING ADHESION. OPERATIONAL RESULTS AND PRELIMINARY LOW TEMPERATURE STUDIES**

In the first part of the report the results obtained during the systematic use of plasma torches on two railway lines worked by heavily loaded coal trains are described. Under the special conditions applicable to these tests the adhesion required for avoiding wheel slipping phenomena had been reached and maintained for approximately 6 hours under unfavourable climatic conditions. In the second part, some tentative ideas concerning the maintenance of the plasma torch equipment and the special plasma vehicle are indicated. Finally the third part of the report deals with the problem of the use of plasma torches at very low temperature (ignition of torches, melting of ice on rails).

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B114/RP 2/E, Oct. 1971, 18 pp, 7 Fig.

ACKNOWLEDGMENT: UIC  
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02 052982

**STUDY OF A PLASMA TORCH FOR IMPROVING ADHESION. THE EFFECT OF THE PLASMA TORCH ON RAIL HEAD CONTAMINATION**

A study of surface contaminants before and after exposure to a plasma torch has shown no evidence of any prominent chemical change being brought about. Laboratory tests have confirmed that oily contamination is removed by the plasma torch. Track tests following a plasma torch rail car indicate that the persistence of the conditioning on running rails is dependent on the effect of subsequent trains.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B114/RP 3/E, Oct. 1971, 25 pp, 15 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
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02 052983

**STUDY OF A PLASMA TORCH FOR IMPROVING ADHESION.  
FINAL OPERATIONAL ASSESSMENT OF THE PLASMA  
TORCH TRAIN**

Data is given on two trials with plasma equipment on the Eastern and Southern Regions of British Rail. Although insufficient data was obtained for a proper statistical evaluation, these trials indicate that any immediate benefit which the plasma torch may confer is not sustained sufficiently to be of benefit to subsequent traffic.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. B114/RP 5/E, Apr. 1973, 14 pp, 7 Fig.

ACKNOWLEDGMENT: UIC  
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02 052990

**IMPROVEMENT OF THE RIDING STABILITY OF EXISTING  
RIV WAGONS REQUIRED TO RUN, UNDER ANY LOADING  
CONDITIONS, AT SPEEDS OF 80 KM/H. CRITERIA FOR  
ASSESSING THE SUITABILITY OF A TWO-AXLED WAGON TO  
RUN AT A MAXIMUM SPEED OF 80 KM/H. TEST PROCEDURE  
BASED ON THIS CRITERION**

ORE Specialists Committee B 56 was entrusted with the work of developing a test procedure which should make it possible to assess, in a uniform manner, the running characteristics of wagons capable of running at 80 km/h under any loading conditions. This is the purpose of the present report. The introduction to the report deals with the origin of the question and sets forth, based on Enquiry Report B 56, the two fundamental methods of assessment. A description is moreover given of the reasons which have caused the Committee to prefer the test procedure based exclusively on safety as minimum requirement and to propose that the measurement of the running characteristics according to the method of the riding index W sub Z should only be used as extended test procedure. In accordance with the aforesaid, the first part of the Interim Report contains a description of the test procedure which is based on the principle of testing from the purely safety point of view. The procedure is based on the measurement of the accelerations at specified distances which are given by the radius of gyration from the centre of gravity. In the second part, the method of the riding index W sub Z is described, which has been made known by ORE Report B 37. This method consists in recording and evaluating oscillations to which the vehicle has been subjected. The accelerations are always measured on the platform above the trailing axle and at the end of a wagon. The limit values laid down for the wagon concerned are riding index W sub Z = 4.25 above the axle and riding index W sub Z = 4.5 at the end of the wagon.

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International Union of Railways Intrm Rpt. B56/RP 1/E, Feb. 1965, 15 pp, Apps.

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02 052991

**IMPROVEMENT OF THE RIDING STABILITY OF EXISTING  
RIV WAGONS REQUIRED TO RUN UNDER ANY LOADING  
CONDITIONS AT SPEEDS OF 80 KM/H. PART 1:STUDY OF  
THE EFFECT OF VARIOUS SIMPLE MODIFICATIONS ON THE  
STABILITY OF OLD-TYPE TWO-AXLED WAGONS (FIRST  
WORK-PROGRESS REPORT). PART 2: ATTEMPT TO DEFINE A  
GENERAL CRITERION FOR RIDING QUALITY**

The first part of this report is an account of the investigations made by the Specialists Committee with a view to ascertaining what inexpensive modifications might be made to old-type two-axled wagons in order to make them suitable for running at 80 km/hour under all loading conditions. At the request of the Control Committee the investigations were restricted to a small number of wagons so as to keep down the costs, viz. two SNCF wagons and two SNCF wagons which were considered sufficiently representative by the Specialists Committee. The modifications made to them, and described in this report, did not result in an adequate improvement in riding

quality. Nevertheless, it seemed advisable to inform the administrations of the results obtained. Among the appendices to this interim report are three reports of tests carried out by the DB at their own expense on three types of DB wagons. Tests in progress at present and recent theoretical studies which will be described in a subsequent report have given encouraging results. The second part of this report specifies the data which the B 56 Committee wishes to collect for the purpose of defining a single criterion for assessing riding quality.

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International Union of Railways Intrm Rpt. B56/RP 2/E, Mar. 1967, 37 pp, 18 App.

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02 052992

**IMPROVEMENT OF THE RIDING STABILITY OF EXISTING  
RIV WAGONS REQUIRED TO RUN UNDER ANY LOADING  
CONDITIONS AT SPEEDS OF 80 KM/H. SUPPLEMENTARY  
TESTS AND RECOMMENDATIONS**

Reports B 56/RP 1 and RP 2 contained the results of technical investigations with a view to defining a general criterion for assessing the riding quality of old-type two-axled wagons, and the results of line tests on these wagons before and after modifications aimed at making them suitable for running at 80 km/hr under all loading conditions. These reports showed that no satisfactory means of modifying the wagons had been found. The present report however, recommends fairly simple and economic modifications which could swiftly be made and so meet the requirements of UIC-Leaflet 439.0. It surveys briefly the results already given in the previous reports, describes the supplementary tests carried out by the SNCF and the JZ and gives the results. It gives some indications concerning theoretical and technical investigations which will be covered in detail in the final report now in preparation, and on some of which the present report is based. In the last chapter, the results obtained are collated, and recommendations are formulated which might be useful to the railway administrations in assessing the riding quality of their two-axled wagons and in making the necessary inexpensive modifications to those wagons found unsuitable. The B 56 Committee has thus completed its task. At the beginning of 1969, however, a final report will be issued giving detailed results of the practical and theoretical investigations and presenting a particular mathematical study undertaken by the Yugoslav Railways. Using this mathematical process the results were similar to those obtained from the track tests, and it might be advantageous to use it in certain instances in order to ascertain which particular wagon component should be modified, and in what way, before undertaking long and costly track tests.

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International Union of Railways B56/RP 3/E, Oct. 1968, 24 pp, 6 Fig., 10 Tab., 9 App.

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02 052993

**IMPROVEMENT OF THE RIDING QUALITY OF EXISTING RIV  
VEHICLES REQUIRED TO RUN AT 80 KM/H UNDER ALL  
LOADING CONDITIONS. SUMMARY OF THE WORK OF THE  
COMMITTEE**

This synoptic report furnishes, first of all, the criteria retained for assessing the suitability of two-axled wagons to run at 80 km/h. One of these criteria concerns the distortion of the track and the other the riding quality (criteria bases on the use of statistical data). The report contains recommendations relevant to the execution of tests in the track (at the responsibility of the Administration). It subsequently indicates the results achieved by means of the various modifications tried and those among them recommended for the wagons considered and also the costs involved. A practical guide is given in the Appendix; it should refer the Administrations to the parts of the report to be consulted when studying the various aspects of the problem. This guide also contains a synoptic table, indicating for all the types of two-axled wagons, their possible suitability and the recommended modifications, if

necessary. The report finally mentions the existence of a mathematical study carried out by the Railway Research Centre of the Yugoslavian Railways. Those Administrations encountering special problems will be able to have recourse to this study.

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International Union of Railways Final Rpt. B56/RP 4/E, Apr. 1969, 27 pp, 3 Tab.

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02 052994

## PREVENTION OF DERAILMENT OF GOODS WAGONS ON DISTORTED TRACKS. WHEEL LOAD MEASUREMENTS AS A MEANS FOR TESTING 2-AXLED GOODS WAGONS

When a 2-axled wagon runs at low speed on a track with varying "twist", the two vertical wheel-loads of one and the same axle are constantly subjected to variations or divergencies which, at every moment, are of equal magnitude but of opposed direction with respect of half the axle-load, which remains almost constant. In order that the wagon can run with the desired safety on all tracks-in that state of maintenance of these considered as economically permissible -it is important that these wheel-load variations are as small as possible and that they remain within a given maximum permissible value, defined by the experimental investigations described in Interim Report No. 3. When the wagon is subjected, according to a well-defined process, to track intentionally "twisted" both in magnitude and direction, the wheel-load variations are represented by means of a diagram ("torsion diagram") the special features of which depend on a certain number of parameters characteristic of the wagon: natural "out-of-plane-ness" of the assembly, torsional stiffness of the assembly, body hysteresis and internal friction of the suspension springs. This diagram gives some useful indications as regards the respective importance of the parameters characteristics of the wagon. Moreover, it makes it possible to determine whether a wagon tested in this way is capable or not of running with adequate safety on a track with a determined "twist". The essential points of the wheel-load diagram ("torsion diagram") are determined by means of a measuring installation, the main parts and mode of functioning of which are dealt with in the last chapter of the present report.

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International Union of Railways Intrm Rpt. B55/RP 1/E, Oct. 1964, 14 pp, 1 Fig.

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02 052995

## PREVENTION OF DERAILMENT OF GOODS WAGONS ON DISTORTED TRACKS. PERMISSABLE WHEEL-LOAD VARIATIONS ON TWO-AXLED GOODS WAGONS. VOLUME 1: REPORT; VOLUME 2: APPENDICES; VOLUME 3: TABLES AND FIGURES

when a two-axled vehicle or bogie with statistically indeterminate support (four-point support) runs over uneven track, its weight  $G$  is irregularly distributed over the four wheels. Because the leading wheel will derail when the ratio between guide force and wheel load exceeds a given critical value, the safety against derailment in track twists depends on the distribution of the wheel loads. The B 55 Specialist Committee was entrusted with the task of determining the critical wheel unloading, which when coinciding with the largest encountered guide forces, leads to derailment. For this purpose, the wheel loads at the leading wheelset of empty goods wagons, pushed through a cant gradient 1 : 100, situated at the exit of a track curve with  $R = 150$  m, were tentatively determined at the commencement of derailment during approximately 100 derailment tests. These tests are described in the present Interim Report No. 3.

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International Union of Railways Intrm Rpt. B55/RP 3/E, Oct. 1966, 132 pp, Figs., Tabs.

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02 052996

## PREVENTION OF DERAILMENT OF GOODS WAGONS ON DISTORTED TRACKS. TWO-AXLED GOODS WAGONS SUBJECTED TO SIMULTANEOUS STRESSES DUE TO TRACK DISTORTION AND TO TRANSVERSE COMPONENTS OF THE FORCES OF THE AUTOMATIC COUPLER. DYNAMIC EFFECTS OF TRACK DISTORTIONS

Reports which were published by the B 55 Specialists Committee so far were concerned with the performance of two-axled wagons fitted with screw couplings and side buffers during quasi-static running on twisted track. This report comprises the results of more recent investigations which are described in detail in three appendices to this report, namely: the performance of two-axled wagons during quasi-static running on twisted track when exposed simultaneously to components of forces in the transverse direction as they may arise from the longitudinal compressive forces of the automatic coupler; the performance of two-axled wagons and bogie wagons negotiating twisted track at higher speeds. The quasi-static tests permitted a value for the coefficient of the safety against derailment to be proposed for tyre profiles with a flange coning angle of 70 degrees. This value is almost half as high again as that for a flange coning angle of 60 degrees; the general introduction of tyre profiles with a flange coning angle of 70 degrees is therefore recommended urgently to enhance the safety against derailment. The representation of the results obtained from the quasi-static tests is supplemented by formulae and a nomogram which make it possible to ascertain for a wagon the transverse components of the coupling forces acceptable on track with a given twist, or the track twist safely negotiable under the effect of a given transverse component of the coupling force. Dynamic tests at speeds up to 120 km/h have shown that the limit value which is valid for quasi-static conditions was exceeded during short periods without resulting in derailment. The discontinuous measuring method did not however, give a trustworthy indication of the actual maximal values and the duration of overstepping of the limit value. These tests and the theoretical investigation have both shown that a certain coincidence of defects (a succession of two defects) may impair the safety against derailment to a particularly severe extent.

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02 053067

## TESTS ON THE TRACK ON THE RIDING STABILITY AND THE GUIDING QUALITY OF VEHICLES BY MEANS OF A SPECIAL VEHICLE. DESCRIPTION OF THE NEW BOGIE WITH ELASTIC PRIMARY SUSPENSION BETWEEN AXLES AND FRAME

The purpose of this experimental bogie fitted under a measuring coach is to study the effect of different design parameters on stability: elastic suspension between bogie frame and axles, wheelbase, suspended mass, vertical load carried by the bogie, tyre profile. This free bogie installed under the measuring coach is subjected only to slippage originating at the point of contact between wheel and rail. The report describes the constructional arrangements adopted to enable the parameters to be varied simply and also the measures adopted to reduce friction to a minimum when the bogie frame rotates and moves relative to the body of the measuring coach.

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International Union of Railways B52/RP 3/E, Oct. 1971, 41 pp, Photos.

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02 053068

**RUNNING SAFETY OF VEHICLES FITTED WITH THE AUTOMATIC COUPLER. CONSIDERATIONS CONCERNING THE TRANSVERSE PLAY IN THE SUSPENSION COMPATIBLE WITH A GOOD RIDING QUALITY ESPECIALLY FOR TWO-AXLED WAGONS, IN TAKING INTO ACCOUNT THE RESULTS OF THE TESTS CARRIED OUT BY THE B93 AND B56 COMMITTEES**

The study of the reports of the ORE Specialists Committee B 93 led the B 125 Committee to the conclusion that, in using a so-called "wear-profile" for the wheel-tyre and for a track-gauge comprised between 1,432 and 1,440 mm, the short single-link suspension (free transverse play plus/minus 7.5 mm) and the long double-link suspension (free transverse play of 20 to 22 mm) were equivalent from the point of view of riding quality, but that, for track-gauges exceeding 1,440 mm, the single short-link suspension resulted in an unacceptable riding quality for speeds higher than approximately 110 km/h. As there are no international regulations limiting the track-gauge to 1,440 mm, the Committee is of the opinion that, for the time being, preference should be given to the long, double-link suspension. After having been informed about a new scheme for a mixed, double-link suspension (with limited transverse play but still with considerable longitudinal play), which presented, theoretically, superior centering characteristics in the transverse direction than those of the present long suspension, the Committee proposes to carry out tests with this new type of suspension. A draft programme for these tests is appended to the report. The report also contains some thoughts concerning the question of the correlation between the tyre-profile on the one hand, and the track-gauge and rail-profile on the other, and also on the choice of value of the transverse play in the suspension.

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International Union of Railways B125/RP 2/E, Oct. 1971, 52 pp, 9 Fig.

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02 053069

**RUNNING SAFETY OF VEHICLES FITTED WITH THE AUTOMATIC COUPLER. CALCULATION BASES FOR DETERMINING THE PERMISSIBLE LONGITUDINAL COMPRESSIVE FORCE FOR TWO-AXLED WAGONS IN ALLOWING FOR THE INTRODUCTION OF A PROGRESSIVE SUSPENSION SYSTEM. TYPICAL RESULTS CHOSEN FROM THE CALCULATIONS MADE**

The present report deals with the extended calculation bases for verifying the running safety of 2-axled goods wagons intended for use with the automatic coupler. This document should be considered as representing a supplement to report B 125/RP 3, Appendix 1. In particular, the calculation method now permits account being taken of the progressive suspension system and of the influence of the gravitational force component due to cant. An appropriate replacement system taking into account the progressive suspension system and the influence of the gravitational force component due to cant has been introduced. The extended calculation method permits a more exact determination and uniform processing of all single and multi-stage suspension systems for 2-axled and bogie wagons. A complete calculation method for 2-axled wagons is thus available.

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International Union of Railways B125/RP 4/E, Oct. 1974, 50 pp, 18 Fig., 5 App.

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02 053177

**INTERACTION BETWEEN VEHICLES AND TRACK, GEOMETRY OF THE CONTACT BETWEEN WHEELSET AND TRACK. PART 2: EQUIVALENT CONICITY VALUES FOR WHEELSETS IN SERVICE**

Measurements have been taken of wheel and rail cross-sectional profiles on SNCF, NS, DB and BR using the BR measuring apparatus. The values of the profile co-ordinates were used to calculate the rolling radius difference

graphs and linearised equivalent conicities; these first results are presented and discussed.

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International Union of Railways C 116/RP 6/E, Apr. 1976, 15 pp, 16 Fig., 4 Tab.

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02 053183

**TESTS ON THE TRACK ON THE RIDING STABILITY AND THE GUIDING QUALITY OF VEHICLES BY MEANS OF A SPECIAL VEHICLE EVALUATION OF RAIL-WHEEL CONTACT THEORY BY EXPERIMENTS**

A mathematical model describing the generation of the lateral motions of railway vehicles can be derived. This model is a useful qualitative description; the poor quantitative results must be attributed to a linear description of the non-linear phenomenon of the wheel-rail contact. The contact forces are characterised in the model by the contact area geometry and the creep coefficients, for which explicit expressions can be derived theoretically for simple geometry. However, the validity of these results in the case of worn wheel and rail surfaces needs experimental investigation. This can successfully be done by a simulation of the lateral motions with a hybrid computer model, using the measured rail position as input. Model adjustment, by a variation of creep coefficient and other uncertain parameters, yields the parameter values for which an optimal correspondence between model output and measured vehicle response is reached. This adjustment has been carried out for different tracks and velocities. The results indicate that many small parameters can indeed be omitted from the model. The optimal value for the equivalent conicity is equal to the value for small disturbances. A dependence has been found in the estimates of creep coefficients and gravitational stiffness, but omission of the gravitational stiffness effect is inadmissible. The good correspondence which was obtained between the theoretical and experimental motions of a bogie justifies the conclusion that the model adjustment technique is well suited to the investigation of the behaviour of railway vehicles.

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International Union of Railways Final Rpt. B52/RP 4/E, Apr. 1976, 41 pp, 5 Fig.

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02 053192

**TRANSMISSION OF VIBRATIONS BY SUSPENSION ELEMENTS AND CONNECTION COMPONENTS WITH THE VEHICLE BODY. ANALYSIS OF THE TESTS MADE ON BEHALF OF THE B79 AND B96 COMMITTEES ON THE VITRY TEST-RIG AND ON THE TRACK FOR SPEEDS COMPRISED BETWEEN 0 AND 250 KM/H. (TEXT AND APPENDICES)**

In this report a study is made of the oscillation paths from wheelsets to vehicle body. The relevant data were obtained during comparative tests carried out on 3 coaches belonging to different Administrations on the test-rig and on the track, for speeds comprised between 0 and 250 km/h. The introduction of parameters known as "transmission coefficients" (i.e. relationship between accelerations on the one hand and connecting system on the other) has enabled the various constructional arrangements of bodies and coaches to be compared, and the behavior of these to be analysed. The report clearly reveals the importance of the high internal damping rate of fitted bodies in the overall damping of the vibrations and also the predominant influence of the quality of the track with respect to wheelset faults (i.e. out-of-balance and out-of-roundness).

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International Union of Railways B96/RP 3/E, Oct. 1971, 203 pp, 105 Fig., 50 Tab.

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02 053193

**TRANSMISSION OF VIBRATIONS BY SUSPENSION ELEMENTS AND CONNECTION COMPONENTS WITH THE VEHICLE BODY. THEORETICAL INVESTIGATION OF COACH-BODY VIBRATIONS**

The dynamic phenomena arising in the contact area between rail and wheel are transmitted to the body through the bogies via their suspension and damping systems. The present report deals with the theoretical investigation of coach-body vibrations, for the following cases: in-phase excitations due to out-of-roundness on the 4 axles; excitations of opposed phase due to out-of-roundness on the 4 axles; excitations due to out-of-balance on the 4 axles. The influence of the various parameters on the transmission of vibrations could in this way be evaluated. In the general conclusions, a comparison is made between the theoretical investigations and the results of the tests on the test-rig.

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International Union of Railways Final Rpt. B96/RP 4/E, Oct. 1972, 77 pp, 110 Fig., 1 Tab.

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02 053194

**PROBLEMS OF INTERACTION OF VEHICLES AND TRACK. ESSAYS AWARDED PRIZES**

No Abstract.

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International Union of Railways Intrm Rpt. C9/RP 2/E, June 1960, 171 pp

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02 053195

**PROBLEMS OF INTERACTION OF VEHICLES AND TRACK. METHODS OF REDUCING WEAR OF RAILS AND TYRES BY LUBRICATION (STATE OF DEVELOPMENT 1959)**

The effect of wear on rails and wheel flanges constitutes a regular and very considerable item of railway expenditure. To this must be added the costs which the immobilisation of the vehicles involves during the time required for returning tyres, etc. The "Methods of reducing the wear of rails and tyres" were dealt with under ORE Question C 19. It was pointed out in the report that there was no agreement as to the best method of applying the lubricant. Several Administrations lubricated the wheel flanges of locomotives, other used rail lubricators in certain curves. During the 16th International Railway Congress in London in 1954, valuable data were supplied by a number of Railway Administrations for Question No. 10: "Wear of rails on curves", sub-section C "Results of the investigations made and proposed remedies. Use of rail lubricating processes". The information available in this field, supplemented by economic-technical investigations, was to be collected by the C 9 Sub-Committee. In accordance with the decision taken by the ORE-C 9-Specialists Committee during its meeting in Paris on 15th April 1955. This would enable the Committee to make recommendations to the Railway Administrations regarding the choice of the most suitable lubrication methods. In particular, the lubrication methods used in normal service these days (manual lubrication of rails, lubricators mounted in the track, flange and rail lubrication carried out from the vehicle) should be analysed and assessed. The simple rail moistening devices, fitted to the locomotives, which still occupied such a place of importance during the discussion on Question No. III "Relations between vehicle and rail and their effect on maintaining safety in operation at high running speeds" during the 12th International Railway Congress in Cairo in 1933, as well as the simple needle lubricators and oil wicks, have not proved adequate to the exacting operating demands of the railways in the long run. This has led to the construction of special, automatically operating lubricators, fitted to the motive power units, which transfer the lubricant on to the rail or wheel flange by means of compressed air or steam.

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International Union of Railways Intrm Rpt. C9/RP 3/E, Apr. 1961, 25 pp, Apps.

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02 053196

**PROBLEMS OF INTERACTION BETWEEN VEHICLE AND TRACK. PERMITTED SERVICE TOLERANCES OF THE PERMANENT WAY IN RELATION TO THE STATE OF THE TRACK AND THE RIDING OF VEHICLES**

Within the sphere of the work on Question C 9, the relations between the state of the track regarding alignment and top and the riding of the vehicle were still further to be investigated. The data supplied by the various railway Administrations should be used to compile the information on the appropriate permissible track tolerances, the values of which were to be related to the riding of the vehicle. The results obtained from tests made by the various railway Administrations have confirmed that the guiding forces between vehicle and track as well as the riding stability of vehicles are greatly influenced by the state of the track regarding alignment and top and the tolerance permitted in the track (see Questions B 6, B 10, B 37, B 52). The track is subject to wear and deformation under the effects of the rolling loads, so that considerable deviations from the theoretical nominal dimensions may arise. The limiting maximum values allowed for these deviations are called the "permitted service tolerances". When these permitted service tolerances (=tolerances admises en service) have been attained or even before this, the track is systematically overhauled. The remaining permissible deviations with respect to the theoretical dimensions are called "maintenance tolerances". Apart from the limits of accuracy prescribed by the technique, the accuracy of the state of the track regarding alignment and top, i.e. the close limit of the tolerances, constitutes an economic problem. Too liberally dimensioned tolerances incur other disadvantages in respect of the guiding forces, the riding stability and the wear. The questionnaire "Relations between the state of the track regarding alignment and top and the riding of vehicles", which had been drawn up by the rapporteurs of the DB, was sent to the Member Administration under cover of an ORE letter the 16th of May 1956. A supplement to this questionnaire was sent out January 1960. The replies received from 17 railway Administrations have been evaluated in the following report (SNCF, BR, DB PKP, FS, SJ, JZ, MAV, OBB, SNCB, NSB, CP, NS, CFF, DSB, CFL, and BCK (narrow gauge)).

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International Union of Railways Intrm Rpt. C9/RP 4/E, Apr. 1961, 19 pp, Apps.

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02 053197

**PROBLEMS OF INTERACTION OF VEHICLES AND TRACK. PERFORMANCE OF SMALL WHEELS NEGOTIATING OBTUSE CROSSINGS AND DIAMOND CROSSING WITH SLIPS**

The problem performance of small wheels negotiating obtuse crossings and diamond crossings with slip as regards the safety of running can be considered according to three processes: the rectilinear path of the axle according to the direction of the gauge lines of the negotiated section; the rectilinear path of the axle according to a direction oblique relative to the gauge lines of the negotiated section; the curvilinear path resulting from a rectilinear direction oblique relating to the guiding lines of the negotiated section and having a translatory movement perpendicular to these gauge lines over the unguided length. The purpose of the following investigations, which are partly theoretical and partly experimental, is to investigate the influence of the angle of attack and that of the transverse force on the axle-boxes on the running performance of small wheels with different tyre profiles in crossings of various designs. The theoretical part is intended to clarify the general geometrical interrelations prevailing between wheelset and crossing and the experimental part, which confirms the calculated results, gives information on the influence of the transverse force on the value of slipping and the limit values to be adhered to in the contact between wheel flanges and crossings in order to ensure the safety against derailments.

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International Union of Railways Intrm Rpt. C9/RP 7/E, Oct. 1965, 21 pp, 18 Fig.

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**02 094584**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 1, TAPE TDOP 0031**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Empty\* Wheel Profile-New 1 in 20\* Spring Group 7-050; 6-051\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-010206CNO001\* Track-Curve\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-010205CNE001\* Track-Curve\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/8 In. clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-010205CN0001\* Track-Curve\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/8 In. clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 185. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/40,  
FRA/DF-75/026, Mar. 1975

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**02 094585**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 1, TAPE TDOP 0032**

The 4 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Empty\* Wheel Profile-New 1 in 20\* Spring Group 7-050; 6-051\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-010202TEM001\* Track-Hi. Spd. CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/8 In. clear.\* Additional Experimental Conditions-None\* Errors noted-ch 46 inoperative, ch 23 no neg. \*\*\*FILE 2: Name-010202TEH001\* Track-Hi. Spd. CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/8 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 46 inoperative, ch 23 neg. inoperative \*\*\*FILE 3: Name-010202TSR001\* Track-Med. Spd. Jtd.\* Speed-24-32 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/8 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch 46 inoperative, ch 23 no neg., ch 41 questionable \*\*\*FILE 4: Name-010202TSM001\* Track-Med. Spd. Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/8 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 46 inoperative, ch 23 no neg.

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**02 094588**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 1, TAPE TDOP 0035**

The 4 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Empty\* Wheel Profile-New 1 in 20\* Spring Group 7-05 O; 6-05 I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-010203TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-3/8 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 & 24 questionable \*\*\*FILE 2: Name-010203TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-3/8 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg. \*\*\*FILE 3: Name-010203TEH001\* Track-Hi.Spd.CWR\* Speed-70 & 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-3/8 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 neg. inoperative, ch 28 calibration questionable \*\*\*FILE 4: Name-010203TSR001\* Track-Med.Spd.Jtd.\* Speed-24 to 32 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-3/8 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg.

See also PB-250 189. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/23,  
FRA/DF-75/023, Mar. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250188/0ST

**02 094589**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 1, TAPE TDOP 0036**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Empty\* Wheel Profile-New 1 in 20\* Spring Group 7-050; 6-051\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-010203TSM001\* Track-Med. Spd. Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-3/8 In. clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg., ch 47 and 48 questionable \*\*\*FILE 2: Name-010201TSR001\* Track-Med. Spd. Jtd.\* Speed-24 to 32 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg. \*\*\*FILE 3: Name-010201TSM001\* Track-Med. Spd. Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg.

See also PB-250 190. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/44,  
FRA/DF-75/030, Mar. 1975



ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250189/8ST

02 094590

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 1, TAPE TDOP 0037**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Empty\* Wheel Profile-New 1 in 20\* Spring Group 7-05 O; 6-05 I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-010201TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 IN.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 No Neg., ch 25 is erroneous\*\*\* FILE 2: Name-010201TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg. \*\*\*FILE 3: Name-010201TEN001\* Track-Hi.Spd.CWR.\* Speed-70 & 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-ch 23 neg. inoperative.

See also PB-250 191. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/45,  
FRA/DF-75/031, Mar. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250190/6ST

02 094591

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 1, TAPE TDOP 0038**

The 4 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Empty\* Wheel Profile-New 1 in 20\* Spring Group 7-05 O; 6-05 I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-010206TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-1/4 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg., ch 17, 20, 25, Off 0 \*\*\*FILE 2: Name-010206TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-1/4 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg. \*\*\*FILE 3: Name-010206TEM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-1/4 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg., ch 22 .2V off 0 \*\*\*FILE 4: Name-010206TSR001\* Track-Med.Spd.Jtd.\* Speed-24 to 32 in 2 mph steps\* Outer Gib Clearance-1/4 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 43 inop., ch 23 no neg.

See also PB-250 192. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/46,  
FRA/DF-75/032, Mar. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250191/4ST

02 094592

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 1, TAPE TDOP 0039**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Empty\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Maly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-010206TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-1/4 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 12 and 43 Inoperative, ch 23 neg. inoperative \*\*\*FILE 2: Name-010205TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-1/4 In.\* Side Bearings-1/8 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg. \*\*\*FILE 3: Name-010205TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-1/4 In.\* Side Bearings-1/8 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch 23 no neg.

See also PB-250 193. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/47,  
FRA/DF-75/033, Mar. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250192/2ST

02 133065

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 3, TAPE TDOP 0080**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-60 ft., 100 Ton Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-05 O; 7-05 I\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-030202TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-030202TSR001\* Track-Med.Spd.Jtd.\* Speed-24 to 32 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-030202TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 13 neg. questionable.

See also PB-250 234. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/94,  
FRA/DF-75/074, May 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250233/4ST



02 133071

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 3, TAPE TDOP 0086**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-60 ft. 100 Ton Box\* Truck-Bosber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5O; 7-D5I\* Snubbing-8-B432;8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-030201CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-Ch. 47 and 13 pos. off 0 \*\*\*FILE 2: Name-030201CNR001\* Track-Curved\* Speed-20mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-030201CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-ch. 27 reversed through MP 32.5; ch 47 neg noise.

See also PB-250 240. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/100, FRA/DF-75/080, June 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250239/1ST

02 133148

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 3, TAPE TDOP 0091**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-Barber SZC\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D5O; 4-D5I\* Snubbing-8-B432\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-030101TEH001\* Track-Hi.Spd. CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-Ch. 44 Bad; Ch. 14-0.7V. off 0 \*\*\*FILE 2: Name-030101TWA001\* Track-Hi. Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-Ch. 14-0.9V. off 0, Ch. 47-1.5V. off 0.

See also PB-250 245. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/105, FRA/DF-75/085, May 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250244/1ST

02 133276

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0144**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF

Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Hydraulic dampers; Long adaptor clearance 0; Long axle controls.\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040304TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-ch. 11-0.25V. off 0; ch. 21 0.25V. off 0 \*\*\*FILE 2: Name-040304TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040304TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 286. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/164, FRA/DF-76/048, Aug. 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250285/4ST, DOTL NTIS

02 133280

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0148**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040401CNE001\* Track-curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 9-1.0V. off 0 \*\*\*FILE 2: Name-040401CNO001\* Track-curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040402CNE001\* Track-curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 290. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/168, FRA/DF-76/052, Aug. 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250289/6ST, DOTL NTIS

02 133388

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0141**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Side frame inertia; Hydraulic dampers; Long

axle controls; Adapter clearance is 0\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040301TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 11 Bad \*\*\*FILE 2: Name-040301TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040301TSR001\* Track-Med.Spd.Jtd.\* Speed-22 to 30 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None

See also PB-250 283. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/161, FRA/DF-76/045, Aug. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250282/1ST

**02 133389**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0142**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D50; 6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Side frame intertie; Hydraulic dampers\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040302TEM001\* Track-Hi. Spd. CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040302TEH001\* Track-Hi. Spd. CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Neg. noise Ch. 13 \*\*\*FILE 3: Name-040302TWA001\* Track-Hi. Spd. Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Neg. Noise Ch. 13.

See also PB-250 284. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/162, FRA/DF-76/046, Aug. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250283/9ST

**02 133390**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0151**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D50; 6-D51\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Individual variations of the different tests are as follows: FILE 1: Name-040402TSR001\* Track-Med.Spd.Jtd.\* Speed-22 to 30 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side

Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-Noise on ch. 39 \*\*\*FILE 2: Name-040403TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-Ch. 39 noisy \*\*\*FILE 3: Name-040403TSR001\* Track-Med.Spd.Jtd.\* Speed-22 to 30 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 293. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/171, FRA/DF-76/055, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250292/0ST

**02 133391**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0152**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D50; 6-D51\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant Contact Side Bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040403TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040401TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040402TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 294. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/172, FRA/DF-76/056, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250293/8ST

**02 133392**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0153**

The 4 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D50; 6-D51\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040401TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040401TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side

Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040402TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 4: Name-040402TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 295. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/173,  
FRA/DF-76/057, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250294/6ST

#### 02 133393

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0154

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D50;6-D5I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant Contact Side Bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040403TEM001\* Track-Hi. Spd. CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040403TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-75000 lb. Preload\* Additional Experimental Conditions-None.

See also PB-250 296. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/174,  
FRA/DF-76/058, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250295/3ST

#### 02 133395

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0156

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D50; 6-D5I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant Contact Side Bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040404CWR001\* Track-curved\* Speed-18 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040405CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040405CND001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 298. Source tape is in ASCII and BINARY character set.

Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/176,  
FRA/DF-76/060, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250297/9ST

#### 02 133396

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0157

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D50; 6-D5I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040406CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040406CNE001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040406CNR001\* Track-Curved\* Speed-18 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 299. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/177,  
FRA/DF-76/061, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250298/7ST

#### 02 133397

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0158

The 4 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D50; 6-D5I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant Contact Side Bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040404TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted ch. 29 0.4V. off 0 \*\*\*FILE 2: Name-040404TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*NOTE: This test is duplicated with same name on TDOP Tape no. 0161 \*\*\*FILE 3: Name-040405TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 4: Name-040405TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 300. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only.

Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/178,  
FRA/DF-76/062, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250299/5ST

**02 133398**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 4, TAPE TDOP 0159**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5O; 6-D5I\* Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant Contact Side Bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040406TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040406TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 301. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/179,  
FRA/DF-76/063, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250300/1ST

**02 133399**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 4, TAPE TDOP 0160**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040406TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 70 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040404TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-040405TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 40 went Bad during test.

See also PB-250 302. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/180,  
FRA/DF-76/064, Sept. 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250301/9ST

**02 133400**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 4, TAPE TDOP 0161**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040404TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None\* NOTE: This is duplicate of test with same name on TDOP tape no. 0158 \*\*\*FILE 2: Name-040404TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 21 0.3v off 0 \*\*\*FILE 3: Name-040404TSR001\* Track-Med.Spd.Jtd.\* Speed-14 to 22 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-2500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 303. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/181,  
FRA/DF-76/065, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250302/7ST

**02 133401**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 4, TAPE TDOP 0162**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040405TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040405TSR001\* Track-Med.Spd.Jtd.\* Speed-14 to 22 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-5000 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 304. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/182,  
FRA/DF-76/066, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250303/5ST

## 02 133402

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0163**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-Constant contact side bearings\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040406TSM001\* Track-Med.Spd.Jtd.\* Speed-65 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040406TSR001\* Track-Med.Spd.Jtd.\* Speed-14 to 22 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 305. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/183, FRA/DF-76/067, Sept. 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250304/3ST

## 02 133403

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0164**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Steel\* Additional Experimental Devices or Conditions-Constant contact side bearings; Long. adapter clear. is 0; Long. controls under axles\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040501TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-Ch. 10-1.0v off 0 \*\*\*FILE 2: Name-040501TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 23 0.3v off 0 \*\*\*FILE 3: Name-040501TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 306. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/184, FRA/DF-76/068, Sept. 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250305/0ST

## 02 133404

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0165**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The

following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5O; 6-D5I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Steel\* Additional Experimental Devices or Conditions-Constant contact side bearings; Long. Adapter clear. is 0; Long. Controls under axles\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040501TSR001\* Track-Med.Spd.Jtd.\* Speed-14 to 22 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-040501TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-Ch. 24 Pos. Bad.

See also PB-250 307. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/185, FRA/DF-76/069, Sept. 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250306/8ST

## 02 133405

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0166**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-New 1 in 20\* Spring Group 7-D5O; 6-D5I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Steel\* Additional Experimental Devices or Conditions-Constant contact side bearings; Long. Adapter clear. is 0; Long. Controls under axles\* Note: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040501CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-Ch. 34 noisy \*\*\*FILE 2: Name-040501CNR001\* Track-Curved\* Speed-18 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-Ch. 300.4v. off 0; Ch. 10-0.2V. off 0 \*\*\*FILE 3: Name-040501CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 308. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/186, FRA/DF-76/070, Sept. 1975

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250307/6ST

## 02 133406

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0167**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-STEEL\* Additional Experimental Devices or Conditions-Constant contact side bearings; Long. adapter clear. is 0; Long. controls under axles\* NOTE: Vertical adapter

forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040502CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 11-0.4v.; ch. 29-0.3v. off 0; ch. 39 Bad \*\*\*FILE 2: Name-040502CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 309. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/187,  
FRA/DF-76/071, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250308/4ST

02 133407

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0168**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D5 O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-STEEL\* Additional Experimental Devices or Conditions-Constant contact side bearings; Long. adapter clear. is 0; Long. controls under axles\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040502TEM001\* Track-Hi.Spd.CWR\* Speed-30 to 60 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 30 cal 5% Low \*\*\*FILE 2: Name-040502TEH001\* Track-Hi.Spd.CWR\* Speed-70 and 79 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 30 cal 5% Low; ch 39 noisy.

See also PB-250 310. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/188,  
FRA/DF-76/072, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250309/2ST

02 133408

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 4, TAPE TDOP 0169**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-New 1 in 20\* Spring Group 7-D5O; 6-D5 I\* Snubbing-8-9031\* Snubber Augmentation-None\* Centerplate Friction-Steel-Steel\* Additional Experimental Devices or Conditions-Constant Contact Side Bearings; Long. Adapter is 0; Long. controls under Axles\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-040502TSM001\* Track-Med. Spd. Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-ch. 30 cal is 5% low\*\*\*FILE 2: Name-040502TSR001\* Track-Mod. Spd. Jtd.\* Speed-22 to 30 in 2mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. Preload\* Additional Experimental Conditions-None\* Errors noted-Ch. 30

cal is 5% low\*\*\*FILE 3: Name-040502TWA001\* Track-Hi. Spd. Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-7500 lb. preload\* Additional Experimental Conditions-None\* Errors noted-ch. 30 Cal is 5% low.

See also PB-250 311. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/189,  
FRA/DF-76/073, Sept. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250310/OST

02 136871

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0170**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D3O;2-D3I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050104CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2:Name-050104CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 312. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/202,  
FRA/DF-76/074, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250311/8ST

02 136872

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0171**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft.9In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group-7-D3O;2-D3I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1:Name-050104MOO001\* Track-Shimmed\* Speed-20 to 28 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050104TSM001\* Track-Mod.Spd.Jtd.\* Speed 15 to 45 to 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050104TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1.4In.Clear\* Additional Experimental Conditions-Reached only 77 mph use file 1 tape 0 1972 for this test\* Errors noted-None.

See also PB-250 313. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.



Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/203,  
FRA/DF-76/075, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250312/6ST

**02 136873**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0172**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurement at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft.9In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group-7D30;2-D3I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050104TWA001\* Track-Hi.Spd.Htd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050104TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch.10-0.5u off 0 on pass 2; ch. 27 was 1.0v off 0 on pass 2.

See also PB-250 314. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/204,  
FRA/DF-76/076, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250313/4ST

**02 136874**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0173**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric description of test conditions. The following are for all tests on this tape: Car-100Ton60FtBox\* Truck-Barber S2C\* Truck Center-46Ft.3In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D70;7-D7I\* Snubbing-8-B432;8B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050403MOD001\* Track-Shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Neg.Noise on Ch. 42 and 45 \*\*\*FILE 2: Name-050403TSM001\* Track-Mod.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 315. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/205,  
FRA/DF-76/077, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250314/2ST

**02 136875**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0174**

The data file, on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the test on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft.9In.\* Load-None\* Wheel profile-Cylindrical\* Spring Group-7-D50;6D5I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* FILE 1: Name-050101TEA002\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 IN.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 36 questionable; ch.23-0.2voff0. \*NOTE:Vertical adapter forces questionable.

See also PB-250 316. Source tape is ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/206,  
FRA/DF-76/078, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250315/9ST

**02 136876**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0175**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the test on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft.9In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D50;6-D5I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* FILE 1: Name-050101TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear\* Additional Experimental Conditions-None\* Errors noted-Ch.26 questionable. \*NOTE: Vertical adapter forces questionable.

See also PB-250 317. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/207,  
FRA/DF-76/079, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250316/7ST

**02 136877**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0176**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100Ton60St Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D70;7-D7I\* Snubbing-813432;86433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050403TWA001\* Track-Hi.Spd.Jtd\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 47 and 48 were 0.8 v. off 0 at end of test\*\*\*FILE 2: Name-050403TEA001\* Track-Hi. Spd. CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch.11-0.35 v off 0.

See also PB-250 318. Source tape is in ASCII and BINARY character set.



Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/208,  
FRA/DF-76/080, Dec. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250317/5ST

**02 136878**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0177**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft.9In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D50;6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE-Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050101CNE001\* Track-Curved\*Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch.30-0.3; ch.41 and 0.4;ch.44-0.4 volts off 0 \*\*\*FILE 2: Name-050101CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 30-0.3 v. off 0.

See also PB-250 319. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/209,  
FRA/DF-76/081, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250318/3ST

**02 136879**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0178**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft9In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D50; 6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050101MOO002\* Track-Shimmed\* Speed-20 to 28 in 2 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch.23 polarity reversed. \*\*\*FILE 2: Name-050101TSM003\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 320. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/210,  
FRA/DF-76/082, Nov. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250319/1ST

**02 136880**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0179**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric description of test conditions. The following are for all tests on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft.9In.\* Load-None\* Wheel Profile-1 in 40\* Spring Group-7-D50;6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE-Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050102MOO001\* Track-Shimmed\* Speed 20 to 28 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050102TSM001\* Track-Med.Spd.Jtd\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch.6-0.3v off 0 \*\*\*FILE 3: Name-050102TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 321. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/211,  
FRA/DF-76/083, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250320/9ST

**02 136881**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0180**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric description of test conditions. The following are for the test on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45Ft.9In.\* Load-None\* Wheel Profile-1 in 40\* Spring Group 7-D50;6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel Moly\* FILE 1: Name05010-2TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4In.Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch.2 has neg. spikes; Ch.30-0.3v.off 0; NOTE: Vertical adapter forces are questionable.

See also PB-250 322. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/212,  
FRA/DF-76/084, Nov. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250321/7ST

**02 136882**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0181**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the test on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel profile-1 in 40\* Spring Group-7-D50;6-D51\* Friction-Steel-Moly\* FILE 1:Name-050102TSM002\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearing-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-Ch 26 inoperative at start of run; Ch. 34 neg. noise NOTE: Vertical adapter forces are subject to question.

See also PB-250 323. Source tape is in ASCII and BINARY character set.

Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/213,  
FRA/DF-76/085, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250322/5ST

#### 02 136962

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0182

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-1 in 40\* Spring Group 7-D50; 6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050102CNE001\* Track-curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050102CNO001\* Track-curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 34 has neg. spikes.

See also PB-250 324. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/214,  
FRA/DF-76/086, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250232/3ST

#### 02 136963

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0183

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-1 in 40\* Spring Group 7-D50; 6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050201MOD001\* Track-Shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 5 inoperative first two passes \*\*\*FILE 2: Name-050201TSM001\* Track-Med. Spd. Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 36 pos. spikes \*\*\*FILE 3: Name-050201TWA001\* Track-Hi. Spd. Jtd.\* Speed-30 to 77 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 325. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/087,  
FRA/DF-76/087, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-240324/1ST

#### 02 136964

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0184

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-1 in 40\* Spring Group 7-D50; 6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* FILE 1: Name-050201TEA001\* Track-Hi. Spd. CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None\* Note Vertical adapter forces are subject to question.

See also PB-250 326. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/216,  
FRA/DF-76/088, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250325/8ST

#### 02 136965

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0185

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-1 in 40\* Spring Group 7-D50; 6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050201CNO001\* Track-curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 36 pos. noise \*\*\*FILE 2: Name-050201CNR001\* Track-curved\* Speed-16 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 36 pos. noise \*\*\*FILE 3: Name-050201CNE001\* Track-curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 327. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-217,  
FRA/DF-76/089, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250326/6ST

#### 02 136966

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0186

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-40 Ton 60 Ft Box\* Truck-Borber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group-7-D70; 7-D71\* Snubbing-8-B422; 8-B433\* Snubber Aug-

mentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearings forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050403CNE001\* Track-curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 36 inop. \*\*\*FILE 2: Name-050403CNR001\* Track-Curved\* Speed-16 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050403CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 328. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/128, FRA/DF-76/090, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250327/4ST

02 136967

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0187**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D30; 3-D31\* Snubbing-8-B421; 8-B422\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side Bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050404CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050404CNR001\* Track-Curved\* Speed-16 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050404CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 40 became Inop. during test.

See also PB-250 329. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/219, FRA/DF-76/091, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250328/2ST

02 136968

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0188**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 to 60 ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D30; 7-D31\* Snubbing-B-421; 8-422\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050404MOO001\*

Track-shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 42-0.8v. off 0 \*\*\*FILE 2: Name-050404TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 330. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Final Rpt. FRA/ORD/MT-76/220, FRA/DF-76/092, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250329/OST

02 136969

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0198**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 ton 60 ft box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 in.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 6-D50; 6-D51\* Snubbing-8-B432;4-H7\* Snubber Augmentation-Hydraulic\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-6-D5 Inner-Inner springs per nest\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050305TEA 001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None\*\*\* FILE 2: Name-050305TWA001\* Track-Hi. Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 44 Inoperative.

See also PB-250 340. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/230, FRA/DF-76/102, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250339/9ST

02 136970

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0199**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 T. 60 ft. Box\* Truck-Barber S-2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 5-D50; 5-D51\* Snubbing-8-B432;8-B433\* Snubber Augmentation-Volute\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050304MOD001\* Track-Shimmed\* Speed-22 to 30 in 2 mph steps\* Outer Gib Clearance-5/8-In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Neg. noise on ch. 42 & 45\*\*\*FILE 2: Name-050304TSM001\* Track-Mod. Spd. Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 341. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/231,  
FRA/DF-76/103, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250340/7ST

**02 136971**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0200**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100T.60 ft. Box\* Truck-Barber S-2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-cylindrical\* Spring Group 5-D50; 5-D5I\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-Voluta\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050304TEA001\* Track-Hi. Spd. CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-None\*\*\*FILE 2: Name-050304TWA001\* Track-Hi. Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 342. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/232,  
FRA/DF-76/104, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250341/5ST

**02 136972**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0201**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 ton 60 ft. box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-cylindrical\* Spring Group 7-D5; 7-D5I\* Snubbing-8-B432;i-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. These on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050301MOD001\* Track-Shimmed\* Speed-20 to 28 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-neg. noise on ch. 42 & 45\*\*\*FILE 2: Name-050301 TSM 001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 41 Inop. to 25 mph.\*\*\*FILE 3: Name-050301TWA 001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearing-1/4 In. Clear\* Additional Experimental conditions-None\* Errors noted-None.

See also PB-250 343. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/233,  
FRA/DF-76/105, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250324/3ST

**02 136981**  
**DOUBLE TRACK POROSITY TESTING**

The Subway Environmental Research Project (SERP) was undertaken in order to provide the subway design engineer with a basic understanding of the effects of various design parameters on subway aerodynamics and thermodynamics (and hence on the subway environment). Such understanding permits subway design with an eye toward efficient environmental control. In Phase II of the SERP, a test matrix designed to study the effects of center wall porosity (in a dual-track tunnel) on train drag and far-field air velocity was performed in the DSI SAT-DT facility. Additional testing in the SAT-DT facility was proposed (and conducted) in an attempt to discover the center wall porosity at which system performance nears that of a single tunnel (i.e., solid center wall). The purpose of this report is to describe the results of this additional testing, and to relate these results to those obtained during the original program.

Transit Development Corporation, Incorporated, Urban Mass  
Transportation Administration, Developmental Sciences, Incorporated,  
Associated Engineers/A Joint Venture, (UMTA-DC-06-0010) Tech. Rpt.  
UMTA-DC-06-0010-75-4, Nov. 1975, 35 pp

Contract DOT-UT-290

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-253232/3ST, DOTL NTIS

**02 137009**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5 TAPE TDOP 0189**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D30; 3-D3I\* Snubbing-8-421; 8-422\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050404TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050404TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 47 became inop. during pass 2.

See also PB-250 331. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/221,  
FRA/DF-76/093, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-240330/8ST

**02 137010**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0190**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D50; 7-D5I\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050405CNR001\* Track-Curved\* Speed-18 mph\* Outer Gib Clearance-5/8 In.\* Side Bear-

ings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 40 inop.; ch. 32 & 34 1.0v off 0 \*\*\*FILE 2: Name-050405CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050405CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 11-0.2 v. off 0.

See also PB-250 332. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/222, FRA/DF-76/094, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-240331/6ST

**02 137011  
TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 5, TAPE TDOP 0191**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D50; 7-D51\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050405MOD001\* Track-Shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050405TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 333. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/223, FRA/DF-76/095, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250332/4ST

**02 137012  
TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 5, TAPE TDOP 0192**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D50; 7-D51\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050405TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 21-1.ov off 0; ch. 39 neg. spikes \*\*\*FILE 2: Name-050405TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 334. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only.

Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/224, FRA/DF-76/096, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250333/2ST

**02 137013  
TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 5, TAPE TDOP 0193**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 5-D50; 5-D51\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-Volute\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-5-D5 Inner-Inner springs per Nest.\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050402MOD001\* Track-shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050402TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 335. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/225, FRA/DF-76/097, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250334/0ST

**02 137014  
TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,  
SERIES 5, TAPE TDOP 0194**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 Ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 5-D50; 5-D51\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-Volute\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-5-D5 Inner-Inner springs per nest\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050402TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050402TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 336. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-75/226, FRA/DF-76/098, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250335/7ST

02 137015

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0195**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 6-D50; 6-D51\* Snubbing-8-B432; 4H7\* Snubber Augmentation-Hydraulic\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-6-D5 Inner-Inner springs per post\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050401MOD001\* Track-Shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050401TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050401TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 337. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/227, FRA/DF-76/099, Jan. 1976

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250336/5ST

02 137016

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0196**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the test on this tape: Car-100 Ton 60 ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 6-D50; 6-D51\* Snubbing-8-B432; 4H7\* Snubber Augmentation-Hydraulic\* Centerplate Friction-Steel-Moly\* FILE 1: Name-050401TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-6-D5 Inner-Inner springs per nest\* Errors noted-ch. 32 Inop 30 to 60 mph\* NOTE: Vertical adapter forces and side bearing forces are subject to question.

See also PB-250 338. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/228, FRA/DF-76/100, Jan. 1976

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250337/3ST

02 137017

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0197**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 6-D50; 6-D51\* Snubbing-8-432; 4H7\* Snubber Augmentation-Hydraulic\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-6-D5 Inner-Inner springs per nest\* NOTE: Vertical

adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050305MOD001\* Track-shimmed\* Speed-24 to 32 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050305TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 339. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/229, FRA/DF-76/101, Jan. 1976

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250338/1ST

02 137018

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0202**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes test on this tape: Car-100 Ton 60 Ft. Box\* Truck-S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-cylindrical\* Spring Group 7-D50; 7-D51\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* FILE 1: Name-050301TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None\* NOTE: Vertical adapter forces and side bearing forces are questionable.

See also PB-250 344. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/234, FRA/DF-76/106, Jan. 1976

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250343/1ST

02 137019

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0203**

The 2 data files on this magnetic tape include acceleration, force and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100Ton60ftBox\* Truck-Barber S26\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D50; 7-D51\* Snubbing-8-B432-8B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050301CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050301CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 13 neg. bad.

See also PB-250 345. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/235, FRA/DF-76/107, Jan. 1976



ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250322/9ST

**02 137020**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0204**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D70; 7-D71\* Snubbing-8-B432;8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050302CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None\*\*\*FILE 2: Name-050302CND001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 346. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/236, FRA/DF-76/108, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250345/6ST

**02 137021**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0205**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 Ft. Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-cylindrical\* Spring Group 7-D70; 7-D71\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050302MOD001\* Track-Shimmed\* Speed-20 to 28 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear\* Additional Experimental Conditions-None\* Errors noted-Neg noise ch. 42 & 45 \*\*\*FILE 2: Name-050302TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050302TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 347. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/237, FRA/DF-76/109, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250346/4ST

**02 137022**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0206**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the test on this tape: Car-100 Ton 60 Ft. Box\* Truck-BarberS2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-cylindrical\* Spring Group 7-D70; 7-D71\* Snubbing-8-B432; 8-B433\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* FILE 1: Name-050302TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None\* NOTE: Vertical adapter forces and side bearing forces are questionable.

See also PB-250 348. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/238, FRA/DF-76/110, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250347/2ST

**02 137023**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0208**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 Ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-cylindrical\* Spring Group 7-D30; 3-D31\* Snubbing-8-B421; 8-B422\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050303TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 30 to 5 v. off 0. \*\*\*FILE 2: Name-050303TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 349. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/239, FRA/DF-76/111, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250348/0ST

**02 137024**

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0209**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 Ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-cylindrical\* Spring Group 7-D30; 3-D31\* Snubbing-8-B421; 8-B422\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050303CNE001\* Track-curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bear-



ings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050303CNO001\* Track-curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 350. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/240,  
FRA/DF-76/112, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250349/8ST

#### 02 137025

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0210

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100 Ton 60 ft Box\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D30; 3-D31\* Snubbing-8-B421; 8-B422\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050303CNE002\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clar.\* Additional Experimental Conditions-No brake rigging B-end\* Errors noted-Ch.36 neg noise \*\*\*FILE 2: Name-050303CNO002\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In.Clar.\* Additional Experimental Conditions-No brake rigging B-end\* Errors noted-None.

See also PB-250 351. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/241,  
FRA/DF-76/113, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250350/6ST

#### 02 137026

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0211

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-100Ton60ftbox\* Truck-Barber S2C\* Truck Center-46 Ft. 3 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group-7D30;3-D31\* Snubbing-8-B421;8-B422\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Side bearing forces are also questionable. Individual variations of the different tests are as follows: FILE 1: Name-050303MOD001\* Track-Shimmed\* Speed-20 to 28 in 2 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4 In.Clar.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050303TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-pos. noise ch. 11 and 39.

See also PB-250 352. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/242,  
FRA/DF-76/114, Jan. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250351/4ST

#### 02 137286

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0099

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D50; 6-D51\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050203MOD001\* Track-Shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050203TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050203TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 353. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/190,  
FRA/DF-76/115, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250352/2ST

#### 02 137287

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0100

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric description of test conditions. The following are for the test on this tape: Car-70TonMReefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group-7-DO;-DI\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* FILE 1: Name-050203TEA001\* Track-Hi.Spd. CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-use only between MP 45.25 and MP 46 on pass 2 for 50 mph\* Errors noted-None\* NOTE: Vertical adapter forces are subject to question.

See also PB-250 354. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/191,  
FRA/DF-76/116, Nov. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250353/0ST

#### 02 137288

##### TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0101

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The

following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D5O; 6-D5I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050203CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050203CNR001\* Track-Curved\* Speed-16 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050203CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 34 has neg. noise.

See also PB-250 355. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/192, FRA/DF-76/117, Nov. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250354/8ST

02 137289

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0117**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D3O; 2-D3I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050204MOD001\* Track-Shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 23 0.3; ch 47-0.3 volts off 0; ch. 14 and 40 interchanged \*\*\*FILE 2: Name-050204TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 14 and 40 interchanged \*\*\*FILE 3: Name-050204TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 14 and 40 interchanged; ch. 32 0.5v. off 0.

See also PB-250 356. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/193, FRA/DF-76/118, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250355/5ST

02 137290

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0118**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the test on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D3O; 2-D3I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* FILE 1:

Name-050204TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 23 0.3 v off 0 \*NOTE: Vertical adapter forces are subject to question.

See also PB-250 357. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/194, FRA/DF-76/119, Dec. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250356/3ST

02 137291

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0119**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D3O; 2-D3I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050204CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050204CNR001\* Track-Curved\* Speed-16 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 47 0.25 v off 0 \*\*\*FILE 3: Name-050204CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 358. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ

Federal Railroad Administration Data file FRA/ORD/MT-76/195, FRA/DF-76/120, Dec. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250357/1ST

02 137292

**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA, SERIES 5, TAPE TDOP 0120**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D7O; 6-D7I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050205CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-Ch. 6-1.0v. off 0 \*\*\*FILE 2: Name-050205CNR001\* Track-Curved\* Speed-16 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050205CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 359. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only.

Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/196,  
FRA/DF-76/121, Dec. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250358/9ST

**02 137293**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0121**

The 3 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D7O; 6-D7I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050205MOO001\* Track-Shimmed\* Speed-12 to 20 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050205TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 3: Name-050205TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 360. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration, Office of Research and Development.  
Data file FRA/ORD/MT-76/197, FRA/DF-76/122, Dec. 1975

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250359/7ST

**02 137294**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0122**

The data file on this magnetic tape includes acceleration, force, and displacement measurements at critical points on a freight car and truck. The file includes detailed alphanumeric descriptions of test conditions. The following are for the test on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-Full\* Wheel Profile-Cylindrical\* Spring Group 7-D7O; 6-D7I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* FILE 1: Name-050205TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*NOTE: Vertical adapter forces are subject to question.

See also PB-254 324. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data file FRA/ORD/MT-76/198,  
FRA/DF-76/123, Dec. 1975

ACKNOWLEDGMENT: NTIS  
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PB-250360/5ST

**02 137303**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0123**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D7O; 6-D7I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050103MOD001\* Track-Shimmed\* Speed-20 to 28 in 2 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-ch. 10 0.7; ch. 30 0.4 v. off 0 \*\*\*FILE 2: Name-050103TSM001\* Track-Med.Spd.Jtd.\* Speed-15 to 45 in 5 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-254 325. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data File FRA/ORD/MT-76/199,  
FRA/DF-76/124, Dec. 1975

ACKNOWLEDGMENT: NTIS  
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Pb-254324/7ST

**02 137304**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0130**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D7O; 6-D7I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050103TEA001\* Track-Hi.Spd.CWR\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None \*\*\*FILE 2: Name-050103TWA001\* Track-Hi.Spd.Jtd.\* Speed-30 to 79 in 10 mph steps\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-254 326. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data File FRA/ORD/MT-76/200,  
FRA/DF-76/125, Dec. 1975

ACKNOWLEDGMENT: NTIS  
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PB-254325/4ST

**02 137305**  
**TRUCK DESIGN OPTIMIZATION PROJECT FIELD TEST DATA,**  
**SERIES 5, TAPE TDOP 0131**

The 2 data files on this magnetic tape include acceleration, force, and displacement measurements at critical points on a freight car and truck. Each file includes detailed alphanumeric descriptions of test conditions. The following are for all tests on this tape: Car-70 Ton M. Reefer\* Truck-ASF Ride Control\* Truck Center-45 Ft. 9 In.\* Load-None\* Wheel Profile-Cylindrical\* Spring Group 7-D7O; 6-D7I\* Snubbing-8-3091\* Snubber Augmentation-None\* Centerplate Friction-Steel-Moly\* Additional Experimental Devices or Conditions-None\* NOTE: Vertical adapter forces are subject to

question. Those on sharper curves or empty cars at high speed are least accurate. Individual variations of the different tests are as follows: FILE 1: Name-050103CNE001\* Track-Curved\* Speed-25 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None\*\*\*FILE 2: Name-050103CNO001\* Track-Curved\* Speed-35 mph\* Outer Gib Clearance-5/8 In.\* Side Bearings-1/4 In. Clear.\* Additional Experimental Conditions-None\* Errors noted-None.

See also PB-250 160. Source tape is in ASCII and BINARY character set. Character set restricts preparation to 9 track one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products, if you have questions.

Bang, AJ  
Federal Railroad Administration Data File FRA/ORD/MT-76/201,  
FRA/DF-76/126, Dec. 1976

ACKNOWLEDGMENT: NTIS  
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PB-254326/2ST

02 138809

#### TRANSIENT ROLL MOTIONS OF A VEHICLE FOLLOWING A PRESCRIBED HORIZONTAL ALIGNMENT

A simple, one-degree-of-freedom model to describe the effect of transition curve design parameters on the transient roll motions experienced in the sprung mass of a road or rail car is developed. Analytical expressions for the roll response to a number of roadway inputs are obtained, and quantified for several representative cases. /Author/ /TRRL/

Good, MC (Melbourne University, Australia) *Australian Road Research*  
Vol. 5 No. 10, Dec. 1975, pp 3-16, 6 Fig., 3 Tab., 15 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220221)  
ORDER FROM: ESL

02 139441

#### LOCOMOTIVE TRUCK HUNTING MODEL. TECHNICAL DOCUMENTATION

Two very different modes of hunting behavior are frequently observed; body hunting and truck hunting. Body hunting or primary hunting is often characterized by violent motions of the carbody. Truck hunting, or secondary hunting, is inherent in the vehicle design. Theoretically, with a perfect cylindrical wheel profile, truck hunting can be eliminated, but cylindrical wheel profile has a number of operating drawbacks. This type of hunting is characterized by severe oscillations of the truck or wheel axle set relative to the carbody. Once truck hunting starts, it continues to worsen as locomotive speed increases. A complete analysis of the hunting of a locomotive should take into consideration the carbody, truck, primary and secondary suspensions, and the wheel-rail contact forces. This requires a dynamic system with multi-degrees of freedom. Five mathematical models were developed with the objective of evaluating primary and secondary hunting of four or six-axle locomotive. A two degree of freedom model was developed for a single wheel-axle set. Seven and nine degree of freedom models were developed for trucks with two or three axles. Combining two of the trucks models with the carbody seventeen and twenty-one degree of freedom locomotive models were obtained. A characteristics equation, based on linear equations of motion was obtained for each model. This equation is a function of velocity. A computer program was written to compute the complex roots (eigenvalues) and the corresponding nonnormalized modes shapes (eigenvectors) of the characteristics equation. This computer program can determine the critical velocity, which is the velocity that coincides with the advent of instability. The resulting computer model would be used primarily as a design tool. In Section 2 the different models are discussed and the equations of motion for the seventeen degree of freedom model are presented. Section 3 includes the results of the 17 and 21 degree of freedom models, along with a discussion on the various parameters which influence the hunting behavior of locomotives. Finally, in section 4 the limitations of the model and suggestions for future improvement are outlined.

Garg, VK Martin, GC Hartmann, PW Tolomei, JG  
Association of American Railroads Technical Center, Federal Railroad  
Administration, Railway Progress Institute, Transportation Development  
Agency No. R-219, No Date, 91 pp, Figs., Tabs.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140  
South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 139447

#### TRAIN OPERATIONS SIMULATOR. USER'S MANUAL

This manual explains input, output and uses of the T.O.S. (Train operation simulator) in detail. Input, output and capabilities of the T.O.S. are explained by several examples. Finally, a brief explanation on installation of the T.O.S. on individual systems and an example of JCL (Job-Control Language) for the IBM 370/158 is given. An attempt has been made to keep this manual user oriented. Detailed information on the program can be found in the programmer's guide.

Luttrell, NW Gupta, RK Low, EM Martin, GC  
Association of American Railroads Technical Center, Federal Railroad  
Administration, Railway Progress Institute, Transportation Development  
Agency No. R-198, No Date, Figs., Tabs.

ACKNOWLEDGMENT: AAR

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South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 139449

#### TWO, THREE AND FOUR AXLE RIGID TRUCK CURVE NEGOTIATION MODEL

The rigid truck curve negotiation model calculates the lateral wheel-rail forces associated with the negotiation of a section of curved track by a rigid framed locomotive truck for a variety of normal operating conditions. The model itself is of a quasi-static nature modeling the truck in static equilibrium for each set of input data. Each truck of the locomotive is modeled individually and is assumed to have a conventional center bearing connection from the bolster to the locomotive, which does not impact any rotational stiffness. (This is a valid assumption under the static context of the model). The model simulates two, three and four axle trucks. The model will also compute the curving forces under various external conditions.

See also Programming Manual, AAR Report R-205, RRIS 02 139450.

Smith, KR MacMillan, RD Martin, GC  
Association of American Railroads Technical Center, Federal Railroad  
Administration, Railway Progress Institute, Transportation Development  
Agency No R-204, No Date, 39 pp, Figs.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140  
South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 139450

#### TWO, THREE AND FOUR AXLE RIGID TRUCK CURVE NEGOTIATION MODEL

The rigid truck curve negotiation computer model is designed to model a rigid locomotive truck on a portion of curved track under any set of arbitrary operating conditions that may be found during normal railroad operations. Due to the nature of the model, the problem to be solved is statically indeterminate. This requires that the method of solution be of an iterative technique combined with a numerical analysis approach. Because this is a static model the actual computation sequence is basically straightforward, however, due to the many different positions that the truck may take during curving, there is a great complexity in insuring that the particular solution arrived at is unique for the situation being modeled. This can be accomplished through an iterative-feedback method such that the output from the preceding iteration is used as an input to the succeeding iteration until both force-moment equilibrium and geometric compatibility are maintained from one iteration to the next. By geometric compatibility, it is meant that at the point of solution the flange force reactions correspond to the points of flange contact that would be predicted using a geometric model based on the friction center location and rubber donut deflections that result from the force model. When this situation is achieved, the solution is unique and may be used with a high degree of confidence.

SUPPLEMENTAL NOTES: See also User's Manual, AAR Report R-205, RRIS 02 139449.

Smith, KR MacMillan, RD Martin, GC

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Development Agency No. R-205, No Date, 18 pp

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 139451

**QUASI-STATIC LATERAL TRAIN STABILITY MODEL. USER'S MANUAL**

The computer program simulates a train section (which could represent an entire train) of up to 100 vehicles on a given track in either buff or draft condition. The model calculates lateral forces at the bolster centers and coupler pins, coupler angles, moments due to alignment control, bolster displacements, centrifugal and superelevation forces, and L/V ratios for both wheel climb and rail rollover. A quasi-static equilibrium position is attained when the bolster displacement and the lateral force are in the same direction. The consist is moved along the track and examined at intervals determined by the speed and time step specified by the user. The track length is limited to 2500 feet. The major application of the program is to investigate the influence of track geometry, vehicle parameters and buff (or draft) loading on the behavior of a train consist.

See also Programming Manual, AAR Report R-208, RRIS 02 139452.

Thomas, LR MacMillan, RD Martin, GC

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Development Agency No. R-207, No Date, 79 pp, Tabs.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 139452

**QUASI-STATIC LATERAL TRAIN STABILITY MODEL. PROGRAMMING MANUAL**

The "Quasi-Static Lateral Train Stability Model" models a train for a force equilibrium condition. The model consists of two principal parts, the TRACK coordinate generation program and the TRAIN program. The TRACK program produces in coordinate form, the track section along which the train consist is to be simulated. The TRAIN program then models the train consist, usually at various positions on the track. The TRACK program establishes coordinates of the continuous track including tangents, spirals, curves, and combinations of them. The TRAIN program consists of a coupler "submodel" and a vehicle "submodel". The coupler submodel calculates the lateral force at the coupler pin due to drawbar forces and also computes coupler angles and alignment control moments. The vehicle submodel develops the lateral loads at the bolster centers using the lateral forces developed in the coupler submodel. Equilibrium is established if the directions of the bolster lateral loads and the bolster displacements are the same. If equilibrium is not achieved, the positions of the units are changed and same procedure repeated until an equilibrium is attained. An independent L/V ratio calculator is also available. Both TRACK and TRAIN programs have been operated on an IBM 370/158 using the level G Fortran compiler. Maximum core required for execution was 292K bytes (Train).

See also User's Manual, AAR Report R-207, RRIS 02-139451.

Thomas, LR MacMillan, RD Martin, GC

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Development Agency No. R-208, 28 pp

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 139457

**FLEXIBLE BODY RAILROAD FREIGHT CAR. USER'S MANUAL**

The freight car is considered to consist of a car body, its contents, two bolsters, and two masses representing the wheelsets/side frames combined. In reality, the car body cannot be a perfectly rigid body. Thus, the carbody flexibility is modelled by separating the car body into two rigid bodies and

connecting them by a cork-like torsional stiffness. Each car body, integrated with the lading, rests on the centerplate of the bolster, having a spring-like stiffness at each of the two contact points. When the contact is lost at either or both of the two points due to car rocking, the spring force between them will be simply zero. On each bolster, a side bearing, either rigid or resilient, is seated with a clearance from the car body at equilibrium. Again, the car body is reacted by the spring-like stiffness of the side bearing when the side bearing is contacted. The bolster is bridged to the wheelset by a suspension spring on each side, which has a equivalent stiffness of the whole suspension group. The friction at the column is at present considered to be a coulomb's dry friction type. Simplifying the analysis, the two wheelsets and the two side frames at one end of the freight car are integrated into one mass. The car is considered to be travelling on staggered jointed track. Roll and bounce are also predicted.

Tse, YH Martin, GC

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Development Agency No. R-200, No Date, 131 pp, Tabs.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 139470

**DYNAMIC PERFORMANCE OF 8-AXLE WAGONS [Osobennosti dinameskih kacestv 8-osnyh vagonov]**

The article gives the results of dynamic tests on this type of flat wagon, and shows the particular running characteristics of these wagons as compared with the 4-axle type. It also gives parameters for statistical distribution of the amplitude of dynamic stresses on the bogie frame side members. [Russian]

Barteneva, LI *Vestnik Vniizt* Vol. 35 No. 2, 1976, pp 25-29, 2 Tab., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Vestnik Vniizt 3-aya-Mytishchinskaya ul. 10, Moscow I-164, USSR

02 139473

**BEHAVIOUR OF RAILWAY VEHICLES WITH REGARD TO OSCILLATION, WHEN RIGHT-HAND AND LEFT-HAND WHEELS ARE ACTUATED INDEPENDENTLY [Das Schwingungsverhalten von Schienenfahrzeugen bei unterschiedlicher rechter und linker Raderregung]**

The author proposes formulae for calculating and defining the characteristics of such behavior. These oscillations cannot be defined by normal dynamics, but rather by methods of the theory of transient phenomena systems. [German]

Krettek, O *Elektrische Bahnen* Vol. 47 No. 3, Mar. 1976, pp 68-74, 1 Fig., 1 Tab., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

02 139474

**EVALUATION OF RAILWAY SYSTEMS DYNAMICS BY MODEL ADJUSTMENT**

In this thesis parameter estimation is applied to the random lateral motions of railway vehicles. A mathematical model describing these motions is given, with independent parameters for all terms which can be related to wheel-rail forces. This includes creep coefficients, the equivalent conicity and the gravitational stiffness parameter, for which theoretical values can be derived. However, the validity of these values in the case of worn wheel and rail surfaces needs experimental investigation. This can be done by simulating the lateral motions with a hybrid computer model, using the measured rail position as input. Model adjustment, by a variation of creep coefficients and other uncertain parameters, yields the parameter values for which an optimal correspondence between model output and measured vehicle response is reached. Most of the resulting parameter estimates reasonably with their theoretical values. This validates the theory and the structure of the mathematical model. However, two parameters have estimates whose values cannot be explained with theory. These parameters have a great impact on

the stability and are indispensable for a proper description of the motions. The satisfactory correspondence that was obtained between experiments and an adjusted model justifies the conclusion that a model with adjusted parameter values can be used reliably for the design of new vehicles.

Broersen, PMT  
Proefschrift T.h. 1976, 111 pp

ACKNOWLEDGMENT: UIC  
ORDER FROM: Netherlands Railways Documentation Center Utrecht, Netherlands

**02 139514**  
**SEVERE WEAR OF ROLLING/SLIDING CONTACTS**

The wear of wheel flanges against the sides of rails is shown to be caused by rolling/sliding contacts sustaining high cyclic stresses at low slide/roll ratios, when these conditions are reproduced in the laboratory severe metallic wear is initiated when the resultant shear stress, which is dependent on both normal (pressure) & tangential (friction) forces, exceeds a critical value. The results are discussed in terms of K.L. Johnson's (1962) shakedown limit and the material's stress/strain characteristics. It is concluded that the severe wear of contacts at low slide/roll ratios is caused by high resolved cyclic stress that result in continual plastic deformation of the surface layers.

Beagley, TM (British Railways Board Technical Center) *Wear* Vol. 36 No. 3, Mar. 1976, pp 317-335, 26 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**02 139515**  
**STATISTICAL REVIEW OF THE DERAILMENT PROBLEM**  
[Statistische Betrachtungen zum Entgleisungsproblem]

To compare the safety of different designs, their risk of failure should be determined. It is shown how the probability of derailment could be calculated. The probable development of the car stock and the influence of the type of joint on the transverse forces are indicated. [German]

Saliger, W (Austrian Federal Railways) *Glaser's Annalen ZEV* Vol. 100 No. 2-3, Feb. 1976, pp 111-117, 2 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**02 139523**  
**DYNAMIC BEHAVIOR OF THE RAILROAD VEHICLES AS RELATED TO THE STRUCTURAL CHARACTERISTICS OF THE TRACK FOR THE STUDY OF THE PROBLEMS OF RUNNING QUALITY** [Sul comportamento dinamico dei veicoli ferroviari in relazione alle caratteristiche della iva nei problemi connessi alla qualita di marcia]

By using a mathematical model, the author develops a movement equation of the vehicle body in case of the vertical and symmetrical excitation, and deduces the expressions of the peak to peak amplitude of the movement, as well as the expression of the vertical acceleration for a given excitation of determined frequency. [Italian]

Giuffre, O (University of Palermo, Italy) *Giornale del Genio Civile* Vol. 114 No. 1-3, Jan. 1976, pp 59-69, 31 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Ministero dei Lavori Pubblici Consiglio Superiore Via Nomentana 2, Rome, Italy

**02 141098**  
**SIMPLIFIED MODELLING OF HIGH ORDER LINEAR SYSTEMS**

Investigations of the response of railway vehicles frequently lead to high order linear systems. Such systems can be solved digitally to any required accuracy but this approach is often time-consuming and does not yield much information on how the response depends on vehicle parameters. In many cases the system can be adequately represented by a low order model. A very simple method of producing such models has been developed by London Transport and forms the basis of this paper. The method, based on the

Schwarz inequality, is relatively easy to apply and ideally suited to systems with an associated quadratic cost function. As well as the theory the paper also presents a practical application to the response of a railway vehicle to random vertical track irregularities.

Presented at the Institute of Physics, Stress Analysis Group, Annual Conference: Stress, Vibration and Noise Analysis in Vehicles, University of Aston, Birmingham, England.

Cotterell, M (London Transport Executive)  
Wiley (John) and Sons, Incorporated 1975, pp 451-460, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Wiley (John) and Sons, Incorporated 605 Third Avenue, New York, New York, 10016

**02 141446**  
**THE LARGE TEST BENCH FOR RUNNING GEAR** [Der Grosswalzprufstand]

High speed running means that the characteristics of rail/wheel interaction and resistance to slipping must be very well known. The Institute for Rail Vehicle and Traction Techniques at the Rhineland and Westphalia Technical University at Aachen has developed a test bench for research into this problem. [German]

Krettek, O Gramatke, KD *Eisenbahntechnische Rundschau* Vol. 25 No. 5, May 1976, pp 307-313, 2 Fig., 14 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

**02 141459**  
**A CONTRIBUTION TO THE PROBLEM OF RAIL CORRUGATION FORMATION** [Ein Beitrag zum Problem der Entstehung der Schienenriffeln]

The author describes corrosion due to running and then for the moving wheel in the elastic rail/wheel system gives details of the wear accumulated between, firstly, vertical acceleration from rail vibrations at acoustic frequency and the acceleration in the wheelset due to the load borne and, secondly, that caused by high frequency vibrations in the wheel center. He describes how in certain spots there is rhythmical polishing followed by the formulation of martensite and he considers that this has a negative effect on the likelihood of natural prevention of rail corrugation. He suggests steps to deal with this problem and explains certain aspects of how rail corrugation occurs and its frequency. [German]

Haass, H *Eisenbahningenieur* Vol. 27 No. 5, May 1976, pp 200-207, 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Dr Arthur Tetzlaff-Verlag Niddastrasse 64, Frankfurt am Main, West Germany

**02 141645**  
**RESEARCH ON THE LIMITS OF THE WHEEL-RAIL SYSTEM. FIELD OF RESEARCH: (1) TRACK--SUMMARY OF RESULTS** [Erforschung der Grenzen des Rad-Schiene-Systeme. Forschungsbereich (1) Fahrbahn-Zusammenfassende Ergebnisse]

A series of tests were made in connection with track as part of the research work requested by the German Federal Ministry. This text describes the tests undertaken and the results obtained. [German]

Eisenmann, J *Mitteilungen des Pruefamttes Bau Landverkehrswegen* Vol. 23 No. 23, 1975, 246 pp, 84 Fig., 14 Tab., 25 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Documentation Bureau, German Federal Railway Arnulfstrasse 19, 8 Munich, West Germany

**02 142262**  
**ON THE APPROXIMATE SOLUTIONS OF A BIQUADRATIC EQUATION FOR WHEELSET HUNTING AND ITS RUNNING STABILITY**

Approximate solutions of a biquadratic equation for a wheelset, derived from the basic differential equations of dynamic hunting, are presented. By comparing the numerical results, using a digital computer with an

approximate formula, it is clear that the approximate solutions agree quite well with the exact values when the speed is less than the hunting velocity. The limits of stability are defined and criteria are established for a wheel tread profile which operates within those limits.

Yokose, K  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 2, 1976, pp 73-77, 3 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

**02 142280**  
**RESPONSE OF AN AXIALLY COMPRESSED BEAM ON VISCOELASTIC FOUNDATION SUBJECTED TO A MOVING FORCE**

The mathematical model for the investigation is made up of a continuous axially compressed beam and a continuous two-stage foundation, the first with linear elasticity and the second consisting of a spring stiffness parallel to a dashpot with a damping coefficient. It is analysed by using Fourier transforms. The author uses the formula for the critical velocity of the load, compares the beam deflections with those taken from the different models devised by Kerr, Kenney, Achenbach, and discusses the results on the basis of the system's parameters and the data obtained.

Rao, DK *High Speed Ground Transportation Journal* Vol. 10 No. 1, Mar. 1976, pp 85-97, 1 Fig., 9 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

**02 142284**  
**RAIL CORRUGATIONS AS RESONANCE EFFECT WITH SPEED-DEPENDENT FREQUENCY SPLITTING OF WHEEL FLEXURAL OSCILLATIONS, AND NON-LINEAR CONTACT FORCES BETWEEN WHEEL AND RAIL**

For more than eighty years the world-wide problem of corrugated rails has produced hundreds of experts' contributions in the railway literature. In West Germany the problem was recently taken up in the Ministry of Research and Technology programme, "Research into the limits of the wheel/rail system", since high train speeds on corrugated rails cause an unacceptable nuisance. In previous articles in this journal, the author indicated the probable cause of rail/wheel corrugations as self-excited ultrasonic waves interacting with audio-frequency wheel vibrations. Now he presents a new theory which, on the one hand, correctly gives the known average corrugation spacing of 4 to 5 cm, and on the other hand permits interpretation of certain fluctuations in the spacings between successive corrugations, and also known relationships between corrugations and operating conditions. [German]

Werner, K *Eisenbahntechnische Rundschau* Vol. 25 No. 6, June 1976, 9 pp

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

**02 142306**  
**RELATIVE OSCILLATORY MOVEMENT AND WHEEL LOAD VARIATIONS IN RAILWAY VEHICLES WITH DIFFERENT RIGHT-WHEEL AND LEFT-WHEEL EXCITATION [Die relativen Schwingungswege und Radlastschwankungen von Schienenfahrzeugen bei unterschiedlicher rechter und linker Raderregung]**

When calculating efforts, it is necessary to know the statistical characteristic factors of wheel load variations. This implies determining the power spectra of the vertical travel of wheels and the rotational movement of wheelsets around the longitudinal axis of the track, as well as the response curves of relative movements and axle load variations. The author defines the response curves for different drive patterns.

Krettek, O *Elektrische Bahnen* Vol. 47 No. 6, June 1976, pp 137-142, 1 Tab., 9 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

**02 142512**  
**DATA ACQUISITION SYSTEM DESIGN MANUAL**

The data acquisition system described in this manual was designed to collect vibration and load data associated with a railway track as a train passes over the track section. The system converts the data to digital form and stores it in a form suitable for analysis on a high speed digital computer. The data acquisition system design embodies features which will permit the application of the system to other data acquisition problems. These features are described in the appropriate sections of this manual. The data acquisition system is a sampled data system. It samples the data at the rate of 30,000 samples per second. The sampling rate is established, and controlled, by the tape storage unit, and cannot be adjusted. The system uses a single 8 bit Analogue to Digital Converter, with a multiplexed input which permits sampling of 1, 2, 4, 8, 16, or 32 channels of data. The data is stored in sequential fashion on magnetic tape at a density of 800 bits per inch, in an IBM compatible form. To simplify analysis, the data is stored on the magnetic tape in blocks. The data block size may be selected to contain 4000, 4096, 8000, 8192, 16000, 16384, or 32000 data words. In addition, each data block carries a record number and a block number as the first two words of the block. The record number is preset by control switches, with the block number automatically incrementing from 0 as data blocks are stored. In addition to the magnetic tape data record, the system provides a photographic record of the test track, with one 35 mm photograph exposed automatically during each data block (no photographs are provided in the 4000 and 4096 data block sizes). A display unit provides a visual display of the record and block numbers, thereby keying the photographic record to the magnetic tape record.

Research funded by the Canadian National and Canadian Pacific Railways, and by the Canadian Transportation Development Agency.

Cornell, ER  
Canadian Institute of Guided Ground Transport, (Project No. 2.9) Final Rpt. CIGGT 76-1, Mar. 1976, 96 pp, 27 Fig., 8 Tab., 1 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

**02 142513**  
**RE-EXAMINATION OF THE PRONENESS TO DERAILMENT OF A RAILWAY WHEELSET**

The circumstances giving rise to the incipient derailment of a railway wheel-set under steady-state rolling conditions are re-examined in the light of recent developments in rolling-contact theory. It is found that the problem can be stated in a form which avoids difficulties inherent in most earlier treatments. However, a quantitative solution requires data relating tangential force to creepage and spin in a parameter region previously unexplored. New experimental results are presented which partially correct this lack of data, but more work, both theoretical and experimental, is required. One outcome of the new study is the establishment of the region of applicability of M.J. Nadal's classical formula. It shows it to be highly relevant for practical decision-making.

Gilchrist, AO (British Railways Board); Brickle, BV *Journal of Mechanical Engineering Science* Vol. 18 No. 3, June 1976, pp 131-141, 30 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**02 142933**  
**RECENT MEASURING OF THE RESISTANCE TO FORWARD MOTION OF ROLLING STOCK**

The experimental measuring of the resistance to forward motion of rolling stock actually running on the track has always been difficult and the results obtained are subject to error. When carrying out research on the operation of trains at high speeds, the SNCF succeeded in devising a more general method which gives reasonably accurate results when measuring the mechanical and aerodynamic forces affecting resistance to forward motion. The authors explain the principles of the testing methods employed, the results obtained with various conventional types of rolling stock before arriving at a formula valid for hauled or mechanically propelled trainsets.



This formula, which assumes that the wind force is nil, takes account of the vehicles' main geometrical dimensions. [French]

Bernard, M Guiheu, C *Revue Generale des Chemins de Fer* Vol. 95 Apr. 1976, pp 243-255

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

02 142935

#### STEERING AND DYNAMIC STABILITY OF RAILWAY VEHICLES

For railway vehicles having coned wheels mounted on solid axles there is a conflict between dynamic stability and steering ability. It is shown that the stiffness and kinematic properties of all possible interwheelset connections are characterised by two properties describing the distortional characteristics of the vehicle in plan. Within this framework, the various possibilities for steered wheelsets are considered, and several past and current proposals are reviewed. Using the linear approach to dynamic stability and curve negotiation the performance of existing and newly proposed configurations is discussed. For any symmetric, two-axle vehicle it is shown that for perfect steering on a curve there should be zero bending stiffness between the wheelsets. It is further shown that if the bending stiffness is zero, the vehicle lacks dynamic stability as the critical speed of instability is zero. In this case, the vehicle undergoes a steering oscillation which occurs at the kinematic frequency of a single wheelset and which is a motion in which pure rolling occurs. Similar results are obtained with vehicles with three or more axles if adjacent axles are connected by shear structures. However, it is shown that it is possible to satisfy both the requirements of perfect steering and a non-zero critical speed if the vehicle has zero bending stiffness and if, in addition to adjacent wheelsets being connected in shear, at least one pair of non-adjacent axles are connected by a shear structure.

Wickens, AH *Vehicle System Dynamics* Vol. 5 No. 1-2, Aug. 1975, pp 15-16

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

02 143041

#### DYNALIST II, A COMPUTER PROGRAM FOR STABILITY AND DYNAMIC RESPONSE ANALYSIS OF RAIL VEHICLE SYSTEMS. VOLUME I. TECHNICAL REPORT

A methodology and a computer program, DYNALIST II, have been developed for computing the response of rail vehicle systems to sinusoidal or stationary random rail irregularities. The computer program represents an extension of the earlier DYNALIST program. A modal synthesis procedure is used which permits the modeling of subsystems or components by partial modal representation using complex eigenvectors. Complex eigenvectors represent the amplitude and phase characteristics of rail vehicle systems which occur as a result of wheel-rail interaction, heavy damping in the suspension system and rotating machinery. Both vertical and lateral motion are handled by the program which allows up to twenty-five component and fifty system degrees of freedom.

Prepared by Wiggins (J. H.) Co., Redondo Beach, Calif.

Hasselmann, TK Bronowicki, A Hart, GC  
Transportation Systems Center, Wiggins (JH) Company, Federal  
Railroad Administration Final Rpt. DOT-TSC-FRA-74-14.I,  
FRA/ORD-75/22.I, Feb. 1975, 118 pp

Contract DOT-TSC-760-1

ACKNOWLEDGMENT: NTIS  
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PB-256046/4ST, DOTL NTIS

02 144091

#### COMPUTATIONAL METHODS TO PREDICT RAILCAR RESPONSE TO TRACK CROSS-LEVEL VARIATIONS

The rocking response of railroad freight cars to track cross-level variations is studied using: (1) a reduced complexity digital simulation model, and (2) a quasi-linear describing function analysis. The reduced complexity digital simulation model employs a rail truck model that neglects the high-frequency dynamics of the bolster and wheelset masses, yet includes kinematic

center plate, side bearings, and wheelset nonlinear effects. This model has computation-time requirements that are less than one eighth those of more detailed computer simulation models and agrees within 15% percent for the prediction of roll angle, side bearing force, center plate force and wheel force at maximum roll angle response with the more detailed models. A study of quasi-linear describing function techniques to compute the steady-state response of freight cars to equivalent sinusoidal cross-level track variations has demonstrated the feasibility of the technique for the types of nonlinearities important in car response. This technique, which computes steady-state response from a set of nonlinear algebraic equations rather than by numerical integration, is effective for parametric studies in which a series of the responses is required as a parameter is varied incrementally since once the solution is obtained for one set of parameter values, additional responses for an incremental change in the parameter are obtained efficiently.

MIT is under contract to Transportation System Center, DOT.

Platin, BE Beaman, JJ Hedrick, JK Wormley, DN  
Massachusetts Institute of Technology, (DOT-TSC-FRA-76-13) Final  
Rpt. FRA-OR&D-76-293, Sept. 1976, 86 pp, 34 Fig., 4 Tab., 12 Ref., 7  
App.

Contract DOT-TS-11201

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

02 144457

#### A METHOD FOR THE MEASUREMENT AND ANALYSIS OF DYNAMIC LOADS [Metodika izmereniia i analiza dinamicheskikh nagruzok, deistvuiushchikh na put']

Experimental research on the dynamics of roadbeds and rolling stock serves to establish permissible speeds and loads for rolling stock. As a method for such experimental research SZD has adopted a complex analysis of both rolling stock and fixed plant. This paper describes the experimental track sections; the basic responses characterizing the action of rolling stock on rails, ties, ballast and subgrade; and the methods for measuring the responses of the track structure. Extensive use of strain gauges is necessary for the dynamic measurements. Other types of instrumentation for deflection and deformation are also described. [Russian]

Complete translation is available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

All-Union Labor Red Banner Railway Research Inst 1976, 8 pp, 2 Ref.,  
1 App.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow  
B-174, USSR

02 144464

#### HOW THE TRACK WORKS UNDER THE TRAINS [Kak rabotaet put' pod poezdami]

The book relates in a popular fashion the reasons for vertical, horizontal, transverse and longitudinal forces acting on track during passage of rolling stock; principles are examined for calculation of the stability and rigidity of track, as well as the determination of permissible train speeds. The requirements for rolling stock for reducing its influence on the track, as well as for the design of track and its maintenance for lowering the occurrence of stresses and deformations are examined. Problems of road bed work and switches under train load are examined. The book includes the bases for the fundamental norms and tolerances for the maintenance of the gauge on straight and curved track; the requirements for the track and rolling stock for sections with high speed train movements are examined. The book is intended for engineers and technicians of train maintenance, railroad and track service workers, and will be useful for railroad engineers working in industrial transportation. [Russian]

Table of Contents only is available in English, original untranslated as of December 1976.

Transport Publishing House 1975, 172 pp, Refs.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow  
B-174, USSR

02 145132

**THE FAST TRACK: FACILITY FOR ACCELERATED SERVICE TESTING**

This brochure describes the initial 22 test segments of the Federal Railroad Administration's FAST (Facility for Accelerated Service Testing) Track at the Transportation Test Center at Pueblo, Colo. The facility was created to provide a full systems approach to track structure and rail vehicle research. It is used to test simultaneously track structures, rail, ties ballast, fasteners, switches, track stability, safety equipment, vehicle components, lading techniques, maintenance methods and equipment under heavy demand conditions.

Federal Railroad Administration Sept. 1976, 18 pp, Figs., Tabs.

ACKNOWLEDGMENT: FRA  
ORDER FROM: FRA

DOTL RP

02 145139

**A MATHEMATICAL SIMULATION OF THE CURVE ENTRY AND CURVE NEGOTIATION DYNAMICS OF FLEXIBLE TWO AXLE RAILWAY TRUCKS**

A 43-degree-of-freedom mathematical model of freight car and two trucks has been established, to simulate the dynamic response of the vehicle as it enters and negotiates a curve. The rigid car body is modeled with three degrees of freedom, and each truck is modeled as a five mass system. Each mass in the truck model has four degrees of freedom, (lateral, yaw, vertical, and roll). Clearances at the interfaces of the respective components are accounted for, and non-linear damping (coulomb) is included at all interfaces except the axle journal/side frame interface. Other non-linearities included in this model include spring bottoming effects, friction creep forces and centerplate breakaway friction forces. The equations of motion for this system are solved, and integrated numerically using an iterative method. A parametric study, using this mathematical model, investigated the effects of track curvature, length of spiral, vehicle velocity, center plate friction forces, wheel conicity and initial configuration prior to curve entry on the lateral flange forces during curve entry and negotiation. It is shown that wheel taper greater than 1 in 20, coupled with a decreased center plate friction level and a reduced stiffness in the longitudinal suspension would minimize flange forces during curving, but is a combination which is undesirable for tangent track yawing stability. This mathematical model predicts the curve negotiation response for the flexible freightcar truck commonly used. Recommendations are made for future design work based on this model, which can help resolve the incompatibility between design requirements for curved and tangent track.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Willis, T Smith, KR (Illinois Institute of Technology)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-14,  
Dec. 1976, 8 pp, 14 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

02 145140

**THE SLIDING SILL UNDERFRAME IN IMPACT SITUATIONS**

Simplified equations of motion for an idealized representation of the sliding sill cushion unit are developed using experimental data from the literature. These equations are then coupled with the fundamental mass, stiffness, and damping characteristics of conventional and sliding sill rail cars to provide an analytical model of the action of sliding sills in impact situations. The equations are solved in closed form for simple impacts and are solved numerically for more complicated impacts. The numerical results are compared with experimental data from an actual switchyard impact.

This work was sponsored by the United States Department of Transportation. Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Peters, DA (Washington University, St Louis)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-13,  
Dec. 1976, 8 pp, 10 Fig., 8 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

02 145148

**LABORATORY TECHNIQUES FOR QUANTIFYING THE PERFORMANCE OF RAIL VEHICLES UTILIZING SERVO-CONTROLLED HYDRAULIC VERTICAL ACTUATORS**

Under the sponsorship of the Federal Railroad Administration a preliminary Vertical Shaker System was installed by Wyle Laboratories in the Rail Dynamics Laboratory at the Transportation Test Center, Pueblo, Colorado. This paper describes the performance of the initial system in the development of the laboratory, the expanded test capabilities of the proposed Vibration Test Unit and Roll Dynamics Unit, and a demonstration of the utility of the shaker system in supporting a program designed to study the effects of freight car truck components and van/trailer loading distribution on the lading response for the Trailer-on-Flatcar configuration.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Bakken, GB (Wyle Laboratories); Fay, GR (Federal Railroad Administration)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-5,  
Dec. 1976, 16 pp, 12 Fig., 2 Tab.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

02 145149

**PERFORMANCE CHARACTERISTICS OF FREIGHT-CAR TRUCKS DETERMINED THROUGH ROAD TESTING**

The behavior of railroad freight-car trucks is described in relation to response modes developed within the truck structure and the freight car. A 70-ton-capacity mechanical refrigerator car equipped with conventional-style, friction-snubbed three-piece trucks was tested under a variety of conditions to develop performance behavior over the speed range of 10-79 mph. Testing was conducted on tangent track and curved track. Response behavior is described in graphs showing frequencies and amplitudes of significant descriptors.

Contributed by the Rail Transportation Division for presentation at the Winter Annual Meeting, New York, December 5-10, 1976, of The American Society of Mechanical Engineers.

Byrne, R Anderson, JA (Southern Pacific Transportation Company)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-4,  
Dec. 1976, 10 pp, 10 Fig., 2 Tab., 2 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

02 145150

**INFLUENCE OF AXLE LOAD, TRACK GAUGE, AND WHEEL PROFILE ON RAIL-VEHICLE HUNTING**

Analyses have been conducted on the influence of axle load, track gauge, and wheel contour on the hunting behavior of simplified models of wheelsets for typical freight-and passenger-car suspensions. The capability of the wheel flange to limit hunting oscillations is found to increase with wheel axle load. The use of worn wheel contours or excessively right gauge is found to increase the susceptibility of the wheelset to excessive and unstable hunting oscillations. For freight-car applications, Coulomb friction in the suspension (e.g., constant-contact side bearings) may act to increase the range of speeds over which hunting will not occur and may permit operation at higher speeds for extremely straight track. However, if track irregularities are sufficient to cause a breakout of the friction, drastic hunting oscillations leading to derailment can occur. Regions of stable limit-cycle hunting and unstable operating conditions are defined. Computational algorithms and computer programs for predicting the boundaries of stable, unstable, and limit-cycle behavior for the wheelset and more complex rail-car analytic models, using the describing-function type of analysis, are presented and reviewed.

Contributed by the Rail Transportation Division for presentation at the Winter Annual Meeting, New York, December 5-10, 1976, of the American Society of Mechanical Engineers.

Hannebrink, DN (Massachusetts Institute of Technology); Lee, HSH Weinstock, H (Transportation Systems Center); Hedrick, JK American Society of Mechanical Engineers Conf Paper 76-WA/RT-3, Dec. 1976, 10 pp, 16 Fig., 1 Tab., 13 Ref., 1 App.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

**02 145151  
INFLUENCE OF NONLINEAR WHEEL/RAIL CONTACT GEOMETRY ON STABILITY OF RAIL VEHICLES**

Nonlinear behavior caused by wheel flanges, worn wheel treads, and dry friction can have an important effect on rail-vehicle stability. In this paper the influence of such nonlinearities on the stability of rail freight vehicles is investigated using quasi-linearization techniques. Nonlinear equations of motion are presented that describe the lateral behavior of a 9-degree-of-freedom representation of a complete freight car with three-piece trucks. The nonlinear wheel/rail geometric constraint functions for the rolling radii, angle of wheel/rail contact, and wheelset roll angle are found by a numerical technique. The suspension description includes dry friction where appropriate. The hunting stability of the freight car is studied by employing describing-function techniques. Results are presented for a typical freight car with three different wheel profiles. The stability results illustrate the dependence of behavior on the amplitudes of vehicle motions. Application of the results in realistic situations and suggestions for future quasi-linear studies are discussed.

Contributed by the Rail Transportation Division for presentation at the Winter Annual Meeting, New York, December 5-10, 1976, of the American Society of Mechanical Engineers.

Hull, R Cooperider, NK (Arizona State University, Tempe) American Society of Mechanical Engineers Conf Paper 76-WA/RT-2, Dec. 1976, 14 pp, 12 Fig., 2 Tab., 25 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

**02 145152  
EFFECTS OF TRUCK DESIGN ON HUNTING STABILITY OF RAILWAY VEHICLES**

A general model of a dual-axle railway vehicle truck is derived. By suitable choices of primary suspension elements, this general model may be specialized to become (1) a roller-bearing freight truck, (2) a plain-bearing freight truck, (3) a roller-bearing truck with primary suspension elements, (4) a passenger truck, (5) a generic model of a freight truck with interconnected wheelsets, or (6) a rigid truck. The truck model is combined with a car body capable of lateral and roll displacements. The effects of the various design parameters on the critical speed for hunting are examined for each configuration.

Contributed by the Rail Transportation Division for presentation at the Winter Annual Meeting, New York, December 5-10, 1976, of the American Society of Mechanical Engineers.

Hadden, JA (Battelle Columbus Laboratories); Law, EH (Clemson University) American Society of Mechanical Engineers Conf Paper 76-WA/RT-1, Dec. 1976, 10 pp, 11 Fig., 1 Tab., 16 Ref.

ACKNOWLEDGMENT: ASME  
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**02 145154  
COMPUTATIONAL METHODS FOR THE PREDICTION OF TRUCK PERFORMANCE IN CURVES**

Characteristics of guidance forces and vehicle parameters for models of curving performance are examined. Methods for computing forces and response of rail vehicles on curves are surveyed. The advantages and limitations of each techniques are discussed and computational procedures appropriate to entry and steady curving are indicated.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Perlman, AB (Tufts University) American Society of Mechanical Engineers Conf Paper 76-WA/RT-15, Dec. 1976, 9 pp, 6 Fig., 31 Ref.

ACKNOWLEDGMENT: ASME  
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**02 145555  
FREQUENCY DOMAIN COMPUTER PROGRAMS FOR PREDICTION AND ANALYSIS OF RAIL VEHICLE DYNAMICS**

No Abstract.

Set includes PB-259287 thru PB-259288.

Transportation Systems Center, Federal Railroad Administration 2 volumes, 218 pp

ACKNOWLEDGMENT: NTIS  
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PB-259286-SET/ST, DOTL NTIS

**02 145556  
FREQUENCY DOMAIN COMPUTER PROGRAMS FOR PREDICTION AND ANALYSIS OF RAIL VEHICLE DYNAMICS. VOLUME I. TECHNICAL REPORT**

Frequency domain computer programs developed or acquired by TSC for the analysis of rail vehicle dynamics are described in two volumes. Volume I defines the general analytical capabilities required for computer programs applicable to single rail vehicles and presents a detailed description of frequency domain programs developed at TSC in terms of analytical capabilities, model description, equations of motion, solution procedure, input/output parameters, and program control logic. Descriptions of programs FULL, FLEX, LATERAL, and HALF are presented. TSC programs for assessing lateral dynamic stability of single rail vehicles are also described.

(PC A06/MF A01) Also available in set of 2 reports as PB-259 286-SET, PC E99/MF E99.

Perlman, AB DiMasi, FP Transportation Systems Center, Federal Railroad Administration Final Rpt. DOT-TSC-FRA-75-16.I, FRA/ORD-76/135.I, Dec. 1975, 116 pp

ACKNOWLEDGMENT: NTIS  
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PB-259287/1ST, DOTL NTIS

**02 145557  
FREQUENCY DOMAIN COMPUTER PROGRAMS FOR PREDICTION AND ANALYSIS OF RAIL VEHICLE DYNAMICS. VOLUME II. APPENDIXES**

Frequency domain computer programs developed or acquired by TSC for the analysis of rail vehicle dynamics are described in two volumes. Volume 2 contains program listings including subroutines for the four TSC frequency domain programs described in Volume I.

(PC A06/MF A01) Also available in set of 2 reports as PB-259 286-SET, PC E99/MF E99.

Perlman, AB DiMasi, FP Transportation Systems Center, Federal Railroad Administration Final Rpt. DOT-TSC-FRA-75-16.II, FRA/ORD-76/135.II, Dec. 1975, 102 pp

ACKNOWLEDGMENT: NTIS  
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PB-259288/9ST, DOTL NTIS

**02 145804  
PLOTING OF THE DYNAMIC SIMULATION MODEL OF THE ASIMO. TEST PHASE 1 [Erstellung des Dynamischen Simulationsmodells der Asimo. Testphase 1]**

Development of the ASIMO program, a general simulation program for vehicles, is reported, in particular the preparation of a dynamic vehicle simulation model based on the equations of motion. Three types of model are distinguished, corresponding to vehicles with static suspension, with primary and secondary suspension, and with an elastic track. Results are presented for an electromagnetic suspension vehicle test model. These show that the 46 eigenvalues of this vehicle can be typically grouped and

interpreted. Track durations are determined by vehicular mass forces and only a little by the variable part of the magnetic forces. Meaningful numerical results may be expected for only carefully selected integration methods, notably those using constant steps. [German]

Duffek, W Federl, U Kortuem, W Richter, R Wallrapp, O  
Deutsche Forschungs-u Versuchsanst f Luft-u Raumft DLR-IB-  
A-552-75/34, 18, Sept. 1975, 107 pp

ACKNOWLEDGMENT: NTIS  
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N76-28114/6ST, DOTL NTIS

02 147575

**LINEAR INDUCTION MOTOR RESEARCH VEHICLE  
WHEEL/RAIL ADHESION TEST**

A principal factor in the design of effective propulsion and braking systems for new rail transportation equipment is the available adhesion vs speed characteristics of steel-wheel-on-steel-rail vehicles. Objectives of the LIMRV wheel/rail adhesion test were: (1) to obtain, over a wide speed range, empirical data that complements the considerable body of data available from previous low-to-moderate-speed investigations, and (2) to determine the extent of loss of available wheel/rail adhesion with increasing vehicle speed. The results obtained are qualitatively compatible with published data on moderate-speed tests; at high speeds, however, degradation of the attainable adhesion coefficient was not apparent. This test program indicates that wheel/rail adhesion may not limit the maximum safe speed of wheel/rail vehicles to the degree previously assumed. It is also evident that for the LIMRV, which has a higher speed capability and apparently a larger attainable wheel/rail adhesion coefficient than a conventional vehicle, the running rail surface exerts a more pronounced effect on the maximum attainable adhesion than does vehicle speed. The measured adhesion values were greater than expected at the higher speeds, but the maximum attainable adhesion coefficient was not determined because of force limitations of the present braking system. It is therefore believed that further testing of the LIMRV could significantly add to the existing body of knowledge on wheel/rail adhesion, particularly in the area of attainable adhesion vs speed relationships.

Research was sponsored by the Federal Railroad Administration, Office of Research and Development.

Chen, RP Sena, GO  
AiResearch Manufacturing Company of California, (75-11970, Rev. 1)  
Final Rpt. FRA-OR7D-76-261, Apr. 1976, 57 pp, Figs., Tabs., 7 Ref., 2  
App.

Contract DOT-FR-40016

ACKNOWLEDGMENT: FRA  
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PB-261853/AS, DOTL NTIS

02 147592

**EVALUATION OF ANALYTICAL AND EXPERIMENTAL  
METHODOLOGIES FOR THE CHARACTERIZATION OF  
WHEEL/RAIL LOADS**

This report has been prepared as part of the Improved Track Structures Research Program sponsored by the Office of Rail Safety Research of the Federal Railroad Administration. The major modes of track degradation have been reviewed to identify the significant wheel/rail loading mechanisms. Analytical models for vehicle/track interaction have been selected for predicting the loads in appropriate formats for each of the major modes of track degradation. This report also evaluates the data required to validate the analytical procedures, and both track and vehicle-borne instrumentation are reviewed for fulfilling these requirements. Available data on wheel/rail loads have been used to assemble a preliminary statistical characterization for interim use.

Research was sponsored by the FRA under contract to the Transportation Systems Center, DOT, Cambridge, Massachusetts.

Ahlback, DR Harrison, HD Prause, RH (Battelle Columbus  
Laboratories); Johnson, MR (ITT Research Institute)  
Battelle Columbus Laboratories, ITT Research Institute, (DOT-  
TSC-FRA-76-10) Intrm Rpt. FRA-OR&D-76-276, Nov. 1976, 261 pp,  
Figs., Tabs., Refs., 4 App.

Contract DOT-TSC-1051

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL RP, DOTL NTIS

02 147598

**PRIORITY SELECTION TECHNIQUE FOR APPLICATION OF  
SUPPLEMENTAL SNUBBING TO 100-TON COVERED HOPPER  
CARS**

This report provides a technique for determine those covered hopper cars which have maximum tendency to derail due to harmonic roll. The critical speeds of 100-ton covered hopper cars with various center of gravity heights are determined. Influence of various factors involved in causing derailments is evaluated. Three criteria based on basic parameters-(1) roll angle, (2) wheel lift, and (3) a combined effect of roll angle, wheel lift and lateral acceleration-are used as a guideline for selecting cars which have the greatest need of supplemental damping. It was found that hypothetical cars with the truck center distance close to the standard 39 foot rail length at critical speeds exhibit severe roll oscillations.

Kasbekar, PV Garg, VK Hawthorne, KL  
Association of American Railroads Technical Center, (Project S-301) Res.  
Rpt. R-235, June 1976, 24 pp, 4 Fig., 4 Tab., 4 Ref., 1 App.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140  
South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 147705

**DYNAMIC SIMULATION OF FREIGHT CAR AND LADING  
DURING IMPACT**

In this report a dynamic analysis is presented to explain damage to railroad cars and lading resulting from impacts. In the analysis, a mathematical model consisting of the car body and freight in the car is presented. Each freight element assumes three degrees of freedom for the computer simulation. A parametric study is made to establish sensitivity of car parameters and impact conditions. The study should be useful to aid in finding means for controlling impact damage and in designing packaging materials.

Kasbekar, PV  
Association of American Railroads Technical Center Res. Rpt. R-249,  
Nov. 1976, 64 pp, 27 Fig., 5 Tab., 13 Ref., 1 App.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140  
South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 147707

**USER'S MANUAL: DETAILED LONGITUDINAL TRAIN ACTION  
MODEL**

Longitudinal behavior of a train, both as a whole and by individual vehicles, is analyzed, with drawbar forces predicted. Shock absorbing linkage systems, such as draft gears, hydraulic cushioning units and sliding sills may be modelled in individual subroutines for "plugging into" the program. The program is general enough to simulate train behavior over arbitrarily chosen track to the extent that any combination of profile and curvature may be used. Motive power, number, characteristic behavior and schedule of application are also arbitrary as are brakes: electrodynamic with characteristic behaviors or pneumatic independent and automatic with assorted brake valve types and arbitrary brake application schedule. Each shock absorbing or linkage unit may be modelled individually. This program could be used as a design tool for linkage and shock absorbing units as well as for consisting, powering, braking and all other represented elements (too numerous to mention) affecting longitudinal behavior.

The Train-Track Dynamics Program is administered by the AAR, and sponsored by the Railway Progress Institute, the FRA, and the Canadian Transportation Development Agency.

Martin, GC Plouffe, WE Ahmed, S Antczak, H Tideman, H  
Association of American Railroads Technical Center R-220, No Date,  
108 pp, 5 Fig., 7 App.

ACKNOWLEDGMENT: Association of American Railroads Technical Center

ORDER FROM: Association of American Railroads Technical Center 3140  
South Federal Street, Chicago, Illinois, 60616

DOTL RP

02 147712

**PROGRAM MULTI: A MULTI-PURPOSE PROGRAM FOR COMPUTING AND GRAPHING ROOTS AND VALUES FOR ANY REAL FUNCTION. USERS/PROGRAMMERS MANUAL**

As part of its activity under the Rail Equipment Safety Project, computer programs for track/train dynamics analysis are being developed and modified. As part of this effort, derailment behavior of trains negotiating curves under buff or draft has been investigated. To determine how critical car and train parameters affect actual stability of various train buckling modes, a generalized multi-purpose computer programs has been developed that can be used to compute and graph cross sections of any surface in space, or to compute and graph the roots of any equation and any function of these roots. It can be used for a variety of applications, including the graphing of multi-valued functions whose branches are not known beforehand. This capability is unique among graphing programs, and it greatly facilitates that analysis of any system with multiple equilibrium branches. The program is especially suited for computing the branches and investigating the stability of nonlinear finite-degree of freedom systems subjected to static loads. The program is oriented towards systems with one or two degrees of freedom, but it can also handle additional degrees of freedom and any number of parametric variables.

Research was sponsored by the FRA, Office of Research and Development.

Brantman, R

Transportation Systems Center, (DOT-TSC-FRA-76-1) Final Rpt. FRA-OR&D-76-143, May 1976, 56 pp, 2 App.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

PB-261121/AS, DOTL NTIS, DOTL RP

02 147713

**AERODYNAMIC FORCES ON FREIGHT TRAINS. VOLUME 1: WIND TUNNEL TESTS OF CONTAINERS AND TRAILERS ON FLATCARS**

The aerodynamic forces on trailers and containers on flatcars have been measured in wind tunnel tests. The forces were measured on the central car of a five-car train consisting of a locomotive, three flatcars with various loadings and a boxcar. Tests were made over a range of yaw angles and with different loadings. Standard trailers, containers and flatcars were tested as well as a variety of modifications designed to improve the aerodynamic performance. In addition to the railroad-car tests, a series of blocks simulating containers and trailer bodies were tested to determine the effect of gap spacing, corner radius, and surface roughness. The flatcars loaded with containers were found to have about forty percent less drag than when loaded with trailers. Various modifications that reduced the frontal area of the trailers or filled in the empty space between the trailer body and the car were all found to be effective in reducing the drag. Gap spacing size had little effect until it became of the order of the body width, and then the drag increased with increased spacing. Side and lift forces are chiefly caused by yaw angle and side area. The forces act near the centroid of the side area, but when the gap spacing becomes large they move farther forward. The research reported is intended to increase the knowledge base in understanding the aerodynamic drag component of trail resistance.

Research was sponsored by the FRA, Office of Research and Development, under contract to the Transportation Systems Center, Cambridge, Massachusetts.

Hammitt, AG

Hammitt (Andrew G) Associates, (DOT-TSC-FRA-76-30,1) Final Rpt. FRA/OR&D-76-295.1, Dec. 1976, 150 pp, 68 Fig., 8 Tab., 24 Ref., 1 App.

Contract DOT-TSC-1002-1

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS, DOTL RP

02 147824

**LOCOMOTIVE-HAULED TRAINS OF SWISS FEDERAL RAILWAYS TRAVEL FASTER ROUND SHARP CURVES**

On account of the great number of curves on the lines of the SBB network attempts are being made on increase the running speed round curves in order to shorten the journey time. A brief outline of the theoretical fundamentals is followed by a report on the results of numerous test runs. The influence of the rail temperature and ambient temperature on the coefficient of transverse friction is discussed. According to the results available, a number of passenger trains could travel faster by about 10-20 km/h, particularly round curves with a radius of more than 400 metres. The technical facilities including the hydraulic tilt system for the series III standard coaches for operation at higher speeds are available. [German]

See also RRIS 03 146282.

Weber, HH *Glaser Annalen ZEV* Vol. 100 No. 9, Sept. 1976, pp 277-284

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

02 148251

**SIX-POINT SUSPENSION SYSTEM FOR A RAILCAR BODY**

A study of lateral and roll responses of a freight car, due to rail input when moving at the critical roll speed is undertaken using the IIT mathematical model. The objective is to generate design criteria for introducing additional spring/damper sets between the bolsters and car body in a typical freight car/truck system. In the cases studied, these additional sets are modeled to be located at the side-bearing points between bolsters and car body. This gives four additional support points for the car, resulting in a six-point suspension configuration. Various values of spring and viscous damper constants are simulated for the additional four suspension points at the side bearings, and the corresponding car body rill and lateral accelerations and displacement are obtained as a function of time.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Willis, T (Illinois Institute of Technology); Shah, HB

American Society of Mechanical Engineers Conf Paper Paper D&O-33, 1976, 5 pp, 12 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ASME

02 148263

**VARIATIONAL FORMULATION OF RAIL OVERTURNING AND A FINITE ELEMENT SOLUTION TECHNIQUE**

The equations governing the behavior of the rail system under vertical, lateral and axial loads are set up. The modeling includes the vertical and lateral deformations as well as twisting deformations. The vertical, lateral and torsional stiffness of the ties are modeled by means of springs. In the formulation discrete as well as distributed springs can be included. The stiffness matrix is obtained by a variational method. Following a discussion of the finite element solution techniques a numerical example is given which also uses a direct variational method.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Arbabi-Kanjoori, F (Illinois Institute of Technology)

American Society of Mechanical Engineers Conf Paper Paper GP-9, 1976, 5 pp, 13 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ASME

02 148271

**FUNCTIONAL REQUIREMENTS FOR A FACILITY FOR ACCELERATED SERVICE TESTING (FAST)**

This report describes recommendations for a proposed Facility for Accelerated Service Testing (FAST) and the rationale for the recommendations. It includes a list of proposed initial test series for railroad track research and railroad mechanical equipment research to be conducted by rapid accumulation of traffic operating continuously on proposed test track loops. The proposed FAST consists of three closed track loops, providing a curvature range up to 10 degrees and a maximum speed capability up to 80 mph. In addition, a Mechanical Loop option is described.

Research was sponsored by the Federal Railroad Administration, DOT.

Punwani, SK Lundgren, JR Martin, GC  
Association of American Railroads Technical Center Final Rpt. FRA-  
/OR&D-76-139, Sept. 1975, 247 pp, Figs., Tabs., 20 Ref., 2 App.

Contract DOT-FR-30038

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

02 148300

**METHOD FOR DETERMINING AND ELIMINATING  
UNBALANCED WHEEL PRESSURES OF RAILWAY VEHICLES  
WITHOUT HAVING TO MEASURE THE LOADS**

The purpose of the method described is to determine and eliminate

unbalanced wheel pressures of railroad vehicles without having to cope with statically indeterminate conditions of the load transfer to the track and without having to measure the loads. This is achieved by placing at least one of the wheel sets on a compensating beam able to carry out rotary movements in respect of the center line of the track, and then measuring, with precision, the thickness of the shim plates which must be placed below one set of springs to balance the load.

Gaidarov, N (Bulgarian State Railways) *Rail International* Vol. 7 No. 7, July 1976, pp 375-378

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

03 052912

**PROBLEMS CONNECTED WITH THE DESIGN, ASSEMBLY AND MAINTENANCE OF TRAILER STOCK WHEELSETS. CONTRIBUTION TO THE DETERMINATION OF THE OPTIMUM CONDITIONS FOR FITTING THE WHEELS ONTO THE AXLE**

This report relates to item 3 of the working programme; it concerns tests on the fitting of wheel-centres onto the axles of coaches and wagons and on their removal. It specifies the purpose of the tests and indicates the procedures adopted. Details are also given about the measurements taken and the results obtained concerning: the pressing-on load and the back-pressure load, and the relationship between these loads, the grip, and the surface conditions, as well as about the distortion of bosses and bores, as analysed by the strain-gauge measurements indicated in Appendix A4. The results of these first tests show that the UIC Leaflet No. 813-0, which specifies a pressing-on load (allowing for lubricating) and a back-pressure test (not compulsory), is inadequate for determining the quality of the wheel/axle assembly and the means of obtaining this quality. It would seem advisable to consider grip and possibly surface conditions, and to give particulars about a new lubricant. Although these first tests do not enable any definite values to be recommended for these parameters, they do show that the bores are distorted as a result of press-fitting, whereas with shrink-fitting there was no distortion with the wheels tested. Since the shape and dimensions of the wheel bosses varied with the two methods, further tests will have to be made to ascertain the causes of the bore distortions, using surface conditions and grip values based on the results of the first tests.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. B79/RP 1/E, Mar. 1966, 31 pp, 5 Fig., 5 Tab., 5 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 052913

**PROBLEMS CONNECTED WITH THE DESIGN, ASSEMBLY AND MAINTENANCE OF TRAILER STOCK WHEELSETS. CONTRIBUTION TO THE DETERMINATION OF THE OPTIMUM CONDITIONS FOR FITTING THE WHEELS ONTO THE AXLE**

This report is a supplement to Interim Report No. 1 which deals with point III of the Programme of Work. It describes the results of tests of pressing solid wheels on and off the axles of hauled stock. This report explains the object of this second series of tests and describes how they were carried out; it also contains the measurements made and the results recorded, for: the loads for pressing-on and pressing-off, the relations between these loads, and the geometric errors of the components after pressing-off, as well as the conclusions concerning the deformation of the bosses and the bores obtained by strain-gauge measurements described in Appendix 2. One of the aims of these tests was to find the causes of distortion of the bores observed during the previous tests and mentioned in RP 1. These tests have also enabled it to be demonstrated that an assembly put together according to the recommendations of RP 1 for the surface condition, the pressing-on load and the lubrication is a good solid job. Moreover, the performance of these tests has enabled one Administration to work out a method for obtaining, with normal machine tools, a surface condition which is within the two limits provisionally fixed. This study was described in an article published in the January 1966 edition of the magazine "Glaser's Annalen". In order to know how assemblies put together by the methods used in the tests will behave in service, some additional tests will be necessary. It seems, that as a first step, some tests carried out in the laboratory on specimens, could make a useful contribution. This is the action that the Committee proposes to take.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. B79/RP 2/E, Oct. 1966, 34 pp, 4 Fig., 4 Tab., 3 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 052914

**PROBLEMS CONNECTED WITH THE DESIGN, ASSEMBLY AND MAINTENANCE OF TRAILER STOCK WHEELSETS. TESTS IN ORDER TO DETERMINE, ON TWO BOGIE VEHICLES, THE EFFECTS ON THE RIDING STABILITY OF WHEEL FLANGES OF REDUCED THICKNESS AFTER REPROFILING**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. B79/RP 4/E, Oct. 1966, 24 pp, 14 Fig., 6 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 052915

**PROBLEMS CONNECTED WITH THE DESIGN, ASSEMBLY AND MAINTENANCE OF TRAILER STOCK WHEELSETS. TESTS ON PASSENGER COACHES TO DETERMINE THE MAXIMUM PERMISSIBLE OUT-OF-ROUNDNESS OF WHEELS (SPEEDS LOWER THAN 150 KM/HR)**

Item I.2 of the Programme of Work of Committee B 79, approved by the Control Committee at its meeting in June 1964, included the examination of the geometric qualities and dynamic balancing of wheel-sets of coaches destined to run at high speeds. This report describes the tests performed on the rolling test bench at Minden with a view to determining the maximum permissible out-of-roundness of wheels while maintaining an acceptable value with reference to oscillations, and a satisfactory coach stability. These tests, which are aimed at keeping wheel-set maintenance within reasonable limits, were carried out on three passenger coaches made available to the Committee by the DB, CFF and SNCF. The results obtained show that, in the test conditions using a rigid-based test bench corresponding only approximately to an actual track, satisfactory riding would be obtained by stipulating a maximum out-of-roundness of plus/minus 0.3 mm for wheels leaving the repair shops. These out-of-roundness values are only valid for speeds up to 150 km/hr and for conventional coaches of the same type as those tested. For higher speeds, and for coaches of clearly different design, other tests could be contemplated.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B79/RP 5/E, Nov. 1967, 15 pp, 8 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 052916

**PROBLEMS CONNECTED WITH THE DESIGN, ASSEMBLY AND MAINTENANCE OF TRAILER STOCK WHEELSETS. TESTS ON PASSENGER COACHES TO DETERMINE THE MAXIMUM PERMISSIBLE OUT-OF-BALANCE OF WHEELS (SPEEDS LOWER THAN 150 KM/HR)**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B79/RP 6/E, Nov. 1967, 26 pp, 9 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 052917

**MAINTENANCE OF THE WHEELSETS OF TRAILER STOCK. TESTS FOR ASCERTAINING THE PERFORMANCE OF TYRE PROFILES IN SERVICE: A) ON PASSENGER COACHES AND WAGONS: SPECIAL COLAR PROFILES; B) ON WAGONS: TYRE PROFILES WITH THINNED FLANGES OR FLANGES BUILT UP BY WELDING**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.



material.  
International Union of Railways B79/RP 7/E, Apr. 1968, 24 pp, 21 Fig., 27 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

**03 052918**  
**MAINTENANCE OF THE WHEELSETS OF TRAILER STOCK. DEVELOPMENT OF OUT-OF-ROUNDNESS AS A FUNCTION OF THE PRECISION OF MACHINING AND THE POSSIBLE PRESENCE OF HARD SPOTS**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B79/RP 8/E, Apr. 1968, 10 pp, Tabs., 14 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

**03 052922**  
**ROLLER BEARING AXLEBOXES AND AXLES. TERMINOLOGY AND CATALOGUE OF DAMAGES. POSITION OF OTHER STUDIES IN PROGRESS**

On the basis of the data furnished by the Administrations on the various types of damage liable to affect roller bearing axle-boxes, it has appeared necessary to elaborate a standardized terminology of their constituent components and a common definition of these types of damage. The former aim is fulfilled by this report. The statistical data henceforth to be furnished by the Administrations can then be used for the determination of the studies to be undertaken on the maintenance or on the choice of roller bearing axle-boxes. Without awaiting the results of the pertinent enquiry, a study was undertaken in order to determine a criterion for evaluating the quality of the grease used for axle-boxes in operation. Already, at this stage it has become clear that a measurement of the iron content does not furnish a criterion enabling the condition of the bearings of an axle-box to be determined with an adequate degree of precision and the research has therefore been aimed at a more complete test on an SKF R2F testing bench. The report finally indicates the first stage of the study undertaken on the maintenance rules through a detailed analysis of the rules at present applied by the Administrations, their motives, the studies and tests conducted, either in progress or visualized.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B95/RP 2/E, Oct. 1970, 42 pp, 56 Fig., 7 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

**03 052923**  
**USE OF LIQUID GAS COOLING FOR REFRIGERATOR VANS. ENQUIRY REPORT**

The purpose of the study was to examine the cooling of refrigerator vans with liquid gas and to draw the relevant conclusions of importance for practical operation. Since this type of cooling presents a new method of refrigeration, there is scarcely any technical literature available on the subject at present. Publications to hand so far have been mainly published by different firms producing gas refrigerating installations. A number of practical tests were carried out side by side with the theoretical study of the physical basis for this method of refrigeration, so as to obtain results as quickly as possible. The practical experiments were to answer the following questions: How does this refrigeration system function in railway vehicles? Is it possible to fit existing refrigerator vans with such refrigerating installations? How effective is the cooling performance and how high the factor of operational safety? What is the operational expense where such installations are used: The results obtained to-date are reviewed in the following report.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B94/RP 1/E, Oct. 1966, 16 pp, 5 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

**03 052950**  
**SOLID CAST WHEELS OF CAST STEEL. ENQUIRY REPORT**

Some European railway Administrations have been approached by American manufacturers with offers to supply solid cast-steel wheels such as are being used on the American railways side-by-side with solid wrought steel wheels. As such wheels do not meet current European regulations, considerable caution will have to be exercised before any decision is taken to use them in either domestic or international services. This report examines the data provided by the American manufacturers, the opinions of European Administrations on the results of tests they have carried out, and the problems which would be raised by the use of solid cast-steel wheels. Mention is made of the financial benefits to the European Administrations if thorough technical investigations indicate the use of such wheels to be feasible, and concludes with a recommendation to set up a Specialist Committee charged with a complete study of the question.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B98/RP 1/E, Oct. 1966, 21 pp, 2 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

**03 052951**  
**GENERAL PROBLEMS CONNECTED WITH WHEELS AND THEIR ASSEMBLY: SOLID CAST-STEEL WHEELS, WHEELS OF DIFFERENT DIAMETER AND SHAPE. FIRST CONTRIBUTION TOWARDS THE STUDY OF WHEELS WITH SMALL DIAMETER (TEXT AND APPENDICES)**

The following subjects are treated in the present report RP 2, concerning "the study of the behaviour in service of small-diameter wheels" (1): preliminary enquiries and tests conducted by several Administrations represented on the Committee, the programme of tests based on the research work carried out by the UIC Working Group for "small wheels", running and braking tests already undertaken. Finally, this report explains that experience gained from the first running tests, especially those conducted on the SNCF, indicated that appreciable improvement in performance was achieved in the case of small 660-mm diameter wheels by substituting for wheels in BV 1 or BV 2, solid rolled wheels with a slightly tempered running surface, having a carbon content lower or equal to 0.52%, a manganese content between 0.65 and 0.75%, with an ultimate tensile strength, measured at 15 mm under the running surface, higher than 82 hbar. Similarly, tests carried out on the DB have shown an improvement in the performance of 730/680 mm small wheels loaded to 9 t (18 t per axle) following the introduction of BV 1 solid wheels having a tempered running surface and a tensile strength equal to or higher than 88.2 hbar (90 kg/mm to the 2nd power). It is proposed in RP 1 that, in the light of these initial conclusions, an additional programme of work be drafted to complement the present data.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B98/RP 2/E, Apr. 1968, 17 pp, Figs., 5 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

**03 052952**  
**GENERAL PROBLEMS CONNECTED WITH WHEELS AND THEIR ASSEMBLY: SOLID CAST-STEEL WHEELS, WHEELS OF DIFFERENT DIAMETER AND SHAPE. FIRST CONTRIBUTION TO THE DETERMINATION OF THE OPTIMUM CONDITIONS FOR FITTING WHEEL TYRES ONTO WHEEL CENTRES**

This report deals with running and braking tests under load on wheel tyres assembled with the wheel centres under given conditions. Precise indications

are given concerning the object of the tests and the conditions under which they were carried out. It also contains details regarding the measurements and the results obtained concerning: the grip and the surface conditions, and the loads, distances covered and braking forces, together with the results of strain gauge measurements of the behavior of the tyre on the rim.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B98/RP 4/E, Apr. 1968, 46 pp, 16 Fig., 4 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

**03 052953**

**GENERAL PROBLEMS CONNECTED WITH WHEELS AND THEIR ASSEMBLY: SOLID CAST-STEEL WHEELS, WHEELS OF DIFFERENT DIAMETER AND SHAPE. SECOND CONTRIBUTION TO THE STUDY OF SOLID CAST- STEEL WHEELS**

In this report referring to the "solid cast-steel wheels" of American manufacture, made according to two different casting processes, an account is given of: operational running tests, carried out on the DB and the SJ, with cast wheels certain of which have a surface-hardened tread, and braking tests on cast-steel wheels, at the Minden test bench. The report also shows that encouraging results have been obtained from the running test with wagons 1 in 2 of which were braked, using solid cast-steel wheels adapted to European conditions and heavy demands with a relatively high carbon content and surface-hardened tread. However, the comparative tests at the vibration and braking test bench on non-hardened solid cast-steel wheels made for use in the USA and possessing an even higher carbon content, have given disappointing results. In fact, of the 2 latter wheels tested (made according to the two different methods of manufacture), one was completely broken during the tests and the other showed considerable cracking. This has revealed the great susceptibility of these wheels to thermal cracks due to braking so that wheels of this type could hardly be considered suitable under European operating conditions.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B98/RP 5/E, Oct. 1969, 31 pp, 34 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

**03 052954**

**GENERAL PROBLEMS CONNECTED WITH WHEELS AND THEIR ASSEMBLY: SOLID CAST-STEEL WHEELS, WHEELS OF DIFFERENT DIAMETER AND SHAPE. ROLLED STEEL WHEELS. SECOND CONTRIBUTION TO THE STUDY OF SMALL WHEELS. (VOLUMES 1 AND 2: TEST, AND APPENDICES 1-6)**

In this report, an account is given of the running tests, the wheel testing machine, the hauling tests on the flat track and the test-runs on long, steep falling-gradients, already carried out. These tests complete those already outlined in Report B 98/RP 2, the conclusions of which are confirmed. It is indicated that a very significant improvement in the performance of wheels of 660 mm, 840 mm and 920 mm diameter is obtained in using, instead of wheels of BV 1 and BV 2 steel, solid rolled wheels of unalloyed steel with treated running tread, having carbon and manganese contents of less than 0.52% and 0.80% respectively, with an ultimate tensile strength, measured at a distance of 15 mm below the running tread, of more than 82 hbar and an elongation of more than 14%. Furthermore, an improved performance is obtained for the DB 730/680 mm diameter wheels in using solid wheels of BV 1 steel with tempered running tread, with a hardness corresponding to a tensile strength of 88.2 hbar. Moreover, the tests have revealed very disturbing deformations of the solid wheels under the effect of the heat generated during tread braking with brake blocks, these deformations sometimes reaching such values that there is a danger of certain international prescriptions failing to be complied with. The solution to the problem might be sought in the choice of the most suitable design and shape of the solid cast-steel wheel. The programme of work has been prepared with this in mind.

Restrictions on the use of this document are contained in the explanatory materials.

International Union of Railways B98/RP 6/E, Oct. 1969, 85 pp, 101 Fig., 21 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

**03 052955**

**GENERAL PROBLEMS CONNECTED WITH WHEELS AND THEIR ASSEMBLY: SOLID CAST-STEEL WHEELS, WHEELS OF DIFFERENT DIAMETER AND SHAPE. THIRD CONTRIBUTION TO THE STUDY OF SMALL WHEELS**

In this report, an account is given of the running tests, the braking tests on the wheel testing machine and the test-runs on long, steep falling-gradients, which complete those described in Report B 98/RP 2 and B 98/RP 6. It is indicated in this document that the conclusions of the previous reports have been confirmed concerning the improvement in the performance of wheels obtained in using solid rolled wheels of unalloyed steel with treated wheel rims. For the wheels of more than 760 mm diameter, the "elastic" and permanent deformations are reduced to acceptable values in the case of wheels with curved web for which the rim-web and web-hub transition planes lie in the rolling circle plane. For the wheels with a diameter equal to or less than 760 mm, the present designs and shapes lead to acceptable deformations under normal service conditions. In conclusion, it is stated that, in the opinion of the members of ORE Committee B98, a first practical solution would appear to have been found concerning the problem of small wheels (diameter greater than 630 mm), the present report thus supplying an initial answer to the questions raised by the Working Group "Small Wheels" of the UIC. Finally, taking into account the information drawn from the tests, it was apparent that additional tests were necessary concerning: the performance of wheels when having reached the wear limit; the direction of curvature of the web of wheels with a diameter of more than 760 mm; the stresses in the wheels and their development; and the improvement of the design of wheels (shape, thickness of web, transition radii,...). The resulting programme of work is indicated in the report.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B98/RP 7/E, Oct. 1970, 118 pp, 62 Fig., 7 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

**03 052964**

**OMISSION OF BAFFLE PLATES FROM CISTERN WAGONS. REPORT OF INQUIRY**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B57/RP 1/E, Nov. 1960, 4 pp, 1 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

**03 052966**

**OMISSION OF BAFFLE PLATES FROM CISTERN WAGONS**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. B57/RP /E, July 1962, 28 pp, 6 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 052969

**STANDARDISATION OF WAGONS. REPORT ON THE ACTIVITIES OF THE JURY FOR THE DESIGN COMPETITION FOR THE "WAGON OF THE FUTURE." VOLUME 1: RESULTS OF THE COMPETITION AND CONCLUSIONS. (PART 1: TEXT). VOLUME 2: MEMORANDUM ON THE WORK AND TECHNICAL DISCUSSIONS OF THE JURY FOR THE DESIGN COMPETITION FOR THE WAGON OF THE FUTURE; APPENDICES (5TH SECTION)**

The present report comprises 5 sections, drawn up in two separate brochures as much for reasons of the time required for the preparation of the report as for the sake of convenience in the subsequent use of the document by the Administrations. Volume I, presented by the chairman of the Jury to the Control Committee on April 18th, 1956, comprises the following 4 sections and a separate part, consisting of 23 plates of illustrations. 1st Section: General account of the whole work of the Jury, indicating the way in which the discussions have led to a satisfactory conclusion of the work performed, and summarizing the most important lessons to be drawn from the competition. 2nd Section: Detailed description by groups of components, of the various essential constructional arrangements for the realization of the type 2 standard open wagon, object of the Competition. 3rd Section: Allocation of awards: prizes, consolation-prizes and honorable mentions. 4th Section: Advantages justifying awards to the designs and ideas concerned. Volume II comprises: 5th Section: Memorandum on the work and technical discussions of the Jury for the Design Competition for the Wagon of the Future.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B12/RP 2/E, Apr. 1956, 54 pp, Tabs., 8 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 052970

**STANDARDISATION OF WAGONS. RESULTS ON THE STATIC AND DYNAMIC TESTS CARRIED OUT ON THE PROTOTYPE VANS**

The present report deals with the tests carried out on behalf of the enlarged ORE Committee B 12, both at the test-station at Vitry-sur-Seine and that at Minden, on the following two covered prototype vans: "Uerdingen" Gmms DB 234; "de Dietrich" SNCF K336799. The test programme was established along the same lines as that adopted for the open prototype wagons discussed in detail in Interim Report No. 3. It comprised: 1) at VITRY: static compression tests on the test bench: compression of 200 tonnes, on all buffers together, simple diagonal compression: 40 tonnes, combined diagonal compression: 40 tonnes and 60 tonnes; static vertical load tests: evenly distributed load: 40 t-tare, concentrated load: 16 tonnes on 3 m, concentrated load: 14 tonnes on 1.5 m; static compression tests, combined with vertical load: 40 t-tare, evenly distributed, combined with compression of 200 tonnes on all the buffers together; static tests of the resistance against torsion (lifting at one corner); resistance tests of the flooring of SNCF 336799 van, supplementing a similar test carried out at Minden; dynamic buffing tests (van load of bulk cereals). 2) at MINDEN: resistance tests of the flooring, resistance tests of the side and end walls, tests of the resistance against torsion.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B12/RP 5/E, July 1961, 35 pp, Apps.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 052971

**STANDARDISATION OF WAGONS. SELF-DISCHARGING WAGON WITH GRAVITY UNLOADING DEVICE. PROPOSED STANDARD TYPE**

At the joint meeting of the 4th and 5th UIC Commissions in Portsmouth in 1962, the standardization characteristics, proposed by the Sub-Commission on characteristics of standard wagons, was approved for a special

2-axled gravity discharging wagon of about 40 cu m capacity. Two alternatives of this wagon could be constructed, viz., the one with roof and the other without. It was decided to incorporate, in UIC Leaflet 571, a special section dealing with this wagon. The B 12 Specialists Committee was charged by the Control Committ of ORE to study the question of the standard construction of this wagon. The B 12 Specialists Committee had proceeded to an enquiry with those Administrations possessing self-discharging wagons answering to practically all the prescriptions of UIC Leaflet 571 and to the constructional principles employed in the ORE standard wagons. The Committee considered that, in view of their operating characteristics and their mode of construction, the self-discharging wagons of the NS and the DB (constructed moreover by the same firm) could be taken as a suitable basis for the study relating to their standardization. Static compression tests and running performance tests, carried out by the DB, had shown that the constructional features of these wagons were sufficient. It was thus decided to submit to the Control Committee of ORE, by way of prototypes, two self-discharging wagons, one taken from the NS rolling stock (Alternative without roof) and the other from the DB rolling stock (alternative with swing-roof) while requesting the Control Committee to give its approval to these two self-discharging wagons being considered as standard ones.

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International Union of Railways Intrm Rpt. B12/RP 6/E, July 1962, 14 pp

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03 052972

**STANDARDISATION OF WAGONS. STATIC AND DYNAMIC TESTS CARRIED OUT ON THE PROTOTYPES OF VANS**

This report covers the tests carried out at Minden (DB) and at Vitry-sur-Seine (SNCF), on behalf of the enlarged ORE Committee B 12, on two prototype wagons: covered van, type 1, "Uerdingen" Gmms 01, DB 257 and two-axled flat wagon, "de Dietrich" SNCF JQhor 122400. The flat wagon was fitted with shock units and had been designed in such a way that the automatic shock-and traction coupler could eventually be fitted without the need for any extensive modifications.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B12/RP 7/E, Oct. 1962, 18 pp, 12 App.

ACKNOWLEDGMENT: UIC  
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03 052973

**STANDARDISATION OF WAGONS. ENQUIRY CONCERNING THE STUDY AND THE CONSTRUCTION OF STANDARD WAGONS SUITABLE FOR BEING FITTED WITH THE AUTOMATIC COUPLER**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B12/RP 8/E, June 1963, 11 pp, 6 App.

ACKNOWLEDGMENT: UIC  
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03 052974

**STANDARDISATION OF WAGONS. STUDY AND TESTS ON STANDARD MODELS OF "UNIFIED" WAGONS SUITABLE FOR BEING FITTED WITH THE AUTOMATIC COUPLER**

The chief object of the present report is to complete the documentation furnished by Appendix 6 of Interim Report No. 8 with the aid of the results acquired up to 15th April 1964. This bringing up to date of the documentation forms the subject of the 2nd part of the present report and of Appendix 1. It is expedient however to fit these results into the more

general framework of the study undertaken by the B 12 Specialists Committee aiming at the adaptation of the underframes of "unified" wagons, of Standard models, so that they may be suitable for being fitted later with the automatic traction and shock coupler and to describe briefly the successive stages of the study, the corresponding programme of work and the guiding rules adopted. This description constitutes the 1st part of the present report.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B12/RP 9/E, June 1964, 11 pp, 4 App.

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**03 052976**  
**STANDARDISATION OF WAGONS. ECONOMIC COMPARISON OF WAGON WALLS COVERED WITH SPECIALLY TREATED BOARDS OR SOLID PANELS**

Study of the economic merits of a possible replacement of the generally used wall-covering of boards for covered wagons by a covering of plywood panels. At the request of the 5th Commission of the UIC, ORE charged the B 12 Specialists Committee with the establishment of an economic comparison between covered wagons with wall-covering forms of boards or of panels. Such an economic balance-sheet had already been established by the DB in the course of 1958. At the request of the Paris Design Office of the SNCF, the Minden Design Office of the DB confirmed that the previously established report was still valid. Balance-sheet No. 1 shows that the increased costs resulting from the application of plywood panels in the place of the generally used boards is redeemed at the end of: 15 years if, during the general overhaul of the G 5 type, all the panels are replaced by new panels, and 10-1/2 years if recovered and repaired panels are used. The SNCF, which tested the plywood-panel covering on only 10 wagons, held the opinion in 1959, that the redemption of this increase could be realised within a period of 6 years. Between 1959 and 1962 it extended its tests to cover 250, then 1,250 wagons (at present, the SNCF possesses 8,300 wagons so equipped) and it has found the maintenance costs of the panelling to be higher than those originally foreseen. An enquiry resumed in 1962 shows that the redemption of the additional cost is realised at the end of 9 years (see balance-sheet No. 2). These results, which only differ very slightly from those found by the DB, confirm the economic merits of the replacement of the generally used wall-covering of boards for covered vans by a covering of plywood panels, when solely considered from the point of view of wagon construction and maintenance i.e. when special considerations relative to the suitability of the wagon stock for certain transports e.g. live-stock and early vegetables, are not to be taken into consideration.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B12/RP 11/E, Oct. 1964, 12 pp, 5 App.

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**03 052977**  
**STANDARDISATION OF WAGONS. PART 1: ECONOMIC COMPARISON OF THE USE OF OAK OR PINE FLOORS FOR WAGONS IN CURRENT USE. PART 2: ECONOMIC COMPARISON CONCERNING THE USE OF ROOFS FORMED OF STEEL OR OF WOOD COVERED WITH WATERPROOF FABRIC OR OF LIGHT ALLOY**

At the request of the 5th Commission of the UIC, ORE charged the B 12 Specialists Committee with the establishment of economic comparisons between the use: of oak floors and pine floors for each of the types of wagons in current use, of covered wagon roofs formed of steel, or of wood covered with waterproof fabric, or of light alloy.

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International Union of Railways Intrm Rpt. B12/RP 12/E, June 1965, 18 pp, 5 App.

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**03 052978**  
**STANDARDISATION OF WAGONS. JUNCTION BOXES FOR REFRIGERATOR WAGONS AND MECHANICALLY REFRIGERATED WAGONS**

No Abstract.

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International Union of Railways Intrm Rpt. B12/RP 13/E, Oct. 1965, 7 pp, 4 App.

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**03 052986**  
**STANDARDISATION OF AIR-CONDITIONING AND HEATING INSTALLATIONS. ENQUIRY INTO THE PRESENT POSITION OF PASSENGER COACH AIR-CONDITIONING IN USE WITH THE ORE MEMBER-ADMINISTRATIONS (TEXT, APPENDICES 1-5, TABLES AND FIGURES)**

An enquiry into the possibility of standardising the air-conditioning equipment in the passenger coaches of the ORE Member-Administrations. A survey of the requirements of such a system is made and a review of some of the different systems of air-conditioning currently in use is given. To find out the present state of air-conditioning in use with the Member-Administrations and to find their requirements, a number of questions were prepared. The replies of the Administrations are tabulated and the possibilities of standardisation are discussed.

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International Union of Railways B107/RP 1/E, Oct. 1970, 129 pp, 12 Fig., 5 Tab.

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**03 052987**  
**STANDARDISATION OF AIR-CONDITIONING AND HEATING INSTALLATIONS. AIR CONDITIONING SYSTEM FOR IMMEDIATE APPLICATION**

The final aim of ORE Specialists Committee B 107 is to produce a specification for a standard air conditioning system for passenger coaches, which will incorporate the results of considerable experience and testing. As such a specification cannot be produced in less than four or five years, this interim report has been produced which recommends the heating, cooling and ventilation capacities, air distribution system and layout of equipment to be adopted as an intermediate part standardisation until the final specification for a standard system can be prepared.

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International Union of Railways B107/RP 2/E, Apr. 1972, 26 pp, 9 Fig., 1 Tab.

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**03 052988**  
**APPLICATION OF THE AUTOMATIC COUPLER TO CARRIAGES. STRENGTH TESTS ON PASSENGER COACHES SUITABLE FOR RECEIVING THE AUTOMATIC TRACTION AND SHOCK COUPLER**

The present report describes the tests, carried out from 1964 to 1966 on 5 RIC passenger coaches belonging to the DB, FS, CFF, SNCB and SNCF, to determine their resistance to compressive and tractive forces. The main purpose of these tests was to examine to what extent the body-frame of the passenger coaches could be adapted to the new force distribution resulting from the installation of the automatic traction and shock coupler. The stress

measurements were taken in particular in the part of the underframe situated between the headstock and the bogie pivot bolster, i.e. the area more especially affected by the forces arising from the application of the automatic coupler. The results of the strength tests carried out on the 5 passenger coaches very clearly show that the design of a passenger-coach underframe can easily be adapted to enable it to withstand the compressive and tractive forces resulting from the application of the automatic traction and shock coupler. Insofar as this report may serve as a guide for the application of the automatic coupler on passenger coaches, attention should be drawn to the following 3 points: 1) Two fundamentally different concepts are involved: the DB have chosen for their passenger coaches an arrangement other than that contemplated for their wagons, whereas the other Administrations have retained the same arrangement for both their passenger coaches and their wagons, i.e. the one shown in drawing UIC/FS 49. 2) The tested coaches were constructed between 1964 and 1966 and, consequently, at a time when the automatic coupler was still not so fully defined as at present. The application of the Willison suspension will in particular involve a modification of the headstock. 3) The investigations and tests in progress should show whether the side-buffers, designed to keep the coupler tensioned, will continue to be necessary on the passenger coaches, when the side-buffers on the wagons are dispensed with. This could result in modifications in the mode of application of the compressive forces and, consequently, in the design of the underframe ends.

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International Union of Railways B85/RP 1/E, Oct. 1968, 10 pp, 11 App.

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03 052997

**STANDARDISATION OF LARGE CONTAINERS AND CONTAINER WAGONS. NORMAL CLOSED CONTAINER CLASS 20-ISO 1C-WITH SIDE WALL DOORS, STANDARD VERSION. DEVELOPMENT, CONSTRUCTION AND TESTING**

The report outlines the development of the ORE prototype to the final testing of the selected design on the test rig and its behaviour under operating conditions. Special attention is paid to technical test procedures suitable for confirming the strength parameters laid down in the ORE draft specifications B 112/RP 4 and for evaluating static and dynamic limiting conditions. The report makes recommendations concerning the possible use of this standard type up to a gross weight of 24 t.

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International Union of Railways B112/RP 13/E, Apr. 1975, 63 pp, 6 Fig., 2 Tab.

ACKNOWLEDGMENT: UIC  
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03 053007

**BUFFERS WITH A LARGE WORK ABSORPTION CAPACITY. RESULTS OF COMPARATIVE TESTS ON BUFFERS OF VARIOUS DESIGNS, CARRIED OUT IN 1957-1958 AND 1959, AT THE SNCF TESTING STATION AT VITRY-SUR-SEINE (TEXT AND ENCLOSURES)**

The present report gives the result of comparative tests which have been carried out, at the testing station at Vitry-sur-Seine, between the various types of buffers used up till now by the Railway Administrations and those of new design which have been developed during the last few years, by several manufacturers, with the aim of achieving an increased protection of wagons and goods, against the impacts which occur in stations, during shunting operations and also en route, on starting and as a result of braking. Such a study comprises two aspects: determination of the behaviour of buffers, on impact, in the shunting yards; determination of the behaviour of buffers, in rafts, at starting and braking. The tests at Vitry deal chiefly with the first of these two aspects; the second will be considered in the General Report, in course of preparation, the comprehensive conclusions of which will deal with the desirable characteristics and the criteria for choosing a buffer.

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International Union of Railways Intrm Rpt. B36/RP 1/E, Feb. 1960, 71 pp, Apps.

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03 053008

**BUFFERS WITH A LARGE WORK-ABSORPTION CAPACITY. BEHAVIOUR OF BUFFERS WITH RUBBER SPRINGS AT LOW TEMPERATURES**

The B 36 Specialists Committee was entrusted with the task of carrying out static and dynamic tests on buffers at temperatures down to -40 degrees C. These tests were carried out: (1) by the Brake Testing Department (Bremsversuchsam) of the DB at Minden (Westphalia); (2) by the Division d'Essais et du Materiel of the SNCF in the Test Station at Vitry-sur-Seine. The following buffers were tested: the SNCF-type with rubber springs, the Paulstra-Saga-Pirelli-type with rubber springs, the CFF-type with Vulkolan springs; the Saga-Pirelli-type with rubber-and friction springs; the CFF-Pirelli-Stabut-type with butyl-rubber springs. The tests have shown that at low temperatures, the hardness of the rubber is increased to a greater or smaller degree according to the quality of the material. As a result of this, the compression capacity of the rubber discs is diminished and this leads to a reduction of the strokes. During the static tests, this phenomenon manifested itself only to a small degree on account of the gradual slow increase of the forces. During the dynamic tests, the variations in the characteristics of the rubber were however very considerable. In the case of impacts at high speeds between empty or only partially loaded vehicles, one must consequently expect unusual shocks on account of the very rapid increase of the forces, though the amount of stored energy remains practically constant. The rubber experts should seek a quality of material, which, though less exposed to the influence of low temperatures, should preserve characteristics suitable for normal temperatures and which should show, even at extreme temperatures, the smallest possible residual deformation after compression.

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International Union of Railways Intrm Rpt. B36/RP 2/E, July 1962, 9 pp, 17 App.

ACKNOWLEDGMENT: UIC  
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03 053009

**BUFFERS WITH A LARGE WORK ABSORPTION CAPACITY. COMPARATIVE TESTS ON BUFFERS**

The purpose of the present report is: to give an account of the study of the behavior of buffers in the trains when running and during brake applications; to fix the desirable characteristics and the criteria for the choice of a modern buffer; to propose, in conclusion, a draft of a UIC-leaflet concerning buffers with a large work absorption capacity for wagons. The first part of this report contains a description of the results of the track tests on normal goods trains composed of normal CFF wagons. These trains had 100, 120 and 150 axles being empty and others loaded to one quarter, one half, three quarters or to capacity. The second part of this report consists of a study aiming at laying down the desirable characteristics and the criteria to be adopted for the choice of a modern buffer. This study successively deals with the following efficacy criteria of a buffer: (a) during an impact, (b) during the running and braking of the trains. The third part of this report consists of a draft of a leaflet concerning buffers with a large work absorption capacity for wagons.

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International Union of Railways Intrm Rpt. B36/RP 3/E, July 1962, 29 pp, 29 App.

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03 053011

**BUFFERS WITH A LARGE WORK ABSORPTION CAPACITY. TESTS ON IMPROVED "OLEO-PNEUMATICS" BUFFERS**

In the period between July and November 1961, the Rolling Stock Research Department of the SNCF had undertaken, upon the request of the NS, tests in order to determine the static and dynamic behavior and also the behavior under alternating forces of the improved OLEO-PNEUMATICS buffers. These buffers had been developed following the tests at Romont in 1959 and 1960 (see Interim Report No. 3), so as to obtain also for the hydraulic buffers a static behavior meeting the prescriptions contained in UIC-leaflet 526, Section 2, while preserving the primordial characteristics of the hydraulic buffers consisting in the variation of the work absorbed as a function of the weight of the vehicle and the impact speed. The tests conducted in accordance with the programme and the test method indicated in Interim Report No. 1 and also the supplementary tests have shown that the characteristics of the improved Oleo-Pneumatics buffers largely correspond to the conditions required in UIC-leaflet No. 526, Section 2, and that their resistance on the tup and to the alternating quasi-static forces has been satisfactory. The Specialists Committee has been of the opinion that it is of importance that the behavior of buffers of this type in a train of at least 150 axles should be verified before any general application of these buffers.

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International Union of Railways Intrm Rpt. B36/RP 4/E, Feb. 1963, 9 pp, 7 App.

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03 053012

**BUFFERS WITH A LARGE WORK ABSORPTION CAPACITY. COMPARATIVE TESTS ON BUFFERS FOR PASSENGER ROLLING STOCK**

The purpose of the present report is to give an account of the comparative tests on buffers for passenger rolling stock, carried out in the Testing Station at Vitry-sur-Seine in 1962. These buffers were submitted to the following tests: Static test, in order to plot the diagram "forces-strokes". Dynamic test on the tup, in order to define the intrinsic characteristics of the buffer. Dynamic buffing test in order to study the behavior of buffers under the operating conditions occurring in practice. The buffers were installed on an SNCF-coach, 1955 type of great length, made of stainless steel. The buffing tests were made while using as stop block an open wagon loaded with pulverous coal and having a weight on rails of 40 tonnes fitted with the SNCF standardised rubber spring buffers (stroke 75 mm). These tests have made it possible to verify the performances of the various proposed types of buffers for passenger rolling stock.

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International Union of Railways Intrm Rpt. B36/RP 5/E, Feb. 1963, 13 pp, Apps.

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03 053013

**BUFFERS WITH A LARGE WORK ABSORPTION CAPACITY. TESTS WITH HYDRO-PNEUMATIC BUFFERS AT BERTRIX, (BELGIUM) IN 1965**

Programme of Work: (a) Tests with improved "Oleo-Pneumatics" buffers (150 axle train); (b) Possible further tests with other types of elastic elements with a view to the future application of the automatic coupler and to removing the fears expressed in this connection by the Operating Departments concerning train-reactions and possible damages to the goods transported; (c) Buffing tests with different types of loading for the purpose of determining the relative influence of the different characteristics of the elastic elements of the buffers, or of the elastic systems for the automatic traction and shock coupler (consequences of above mentioned Point (b); and (d) Calculations on the computer for the purpose of determining the longitudinal forces and reactions in long trains under different conditions, especially during emergency braking at low speeds (0-30 km/hr).

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International Union of Railways Intrm Rpt. B36/RP 6/E, Mar. 1966, 29 pp, Figs., Tabs.

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03 053014

**ELASTIC SYSTEMS FOR TRACTION AND SHOCK GEAR (SIDE-BUFFERS AND CENTRE-BUFFERS). INFLUENCE OF THE CHARACTERISTIC OF THE SIDE-BUFFERS ON THE STRESSES EXERTED ON THE LOAD DURING IMPACTS (TEST CARRIED OUT AT MAARN, NETHERLANDS, IN 1967)**

The Report describes impact tests on 20 and 40 t good wagons, fitted with side-buffers of various designs. In order to study the influence of the shape of the characteristic on the behavior of the load, the test wagons were loaded with unsecured blocks of salt, freely stacked (representative of rigid, but fragile loads) or with bags of cement (representative of deformable, but non-elastic loads). During the impacts, speeds, buffer forces, buffer strokes and the stresses in the solebars were measured. After each test, the condition of the load was assessed. The assessment of the tests has shown that the most unfavourable effect on the load occurred in the case of the light-loaded wagon. As soon as more than 400 kN were measured in the two side-buffers of a wagon, considerable disorder and damage of the load were observed. At higher force levels, also the proportion of impact energy absorbed by wagon and load was progressively increased. The continued assessment also enables guiding values for the elastic systems of the automatic coupler to be stated. It should, however, be observed that, on the occasion of these tests with side-buffers, the vehicles could be separated after the impact and they were not interconnected as in the case of the automatic coupling.

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International Union of Railways B36/RP 7/E, Apr. 1969, 35 pp, 63 Fig., 7 Tab.

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03 053015

**ELASTIC SYSTEMS FOR TRACTION AND SHOCK GEAR (SIDE BUFFERS AND CENTRE BUFFERS). LOADING OF BUFFERS IN SERVICE**

With a view to gaining more accurate information on the total loading to which elastic systems are subjected by compressive stresses in railway operations, tests were made on the system of the DB with ten two-axled wagons of each of the five wagon categories E, F, G, L and U. Five wagons of each category were running on normal commercial service, the other five of each category (three loaded and two empty) having been run according to a timetable. The wagons were equipped with mileage meters (in km) and 590 kN buffers with four counters, each recording when a given stroke was exceeded. Results of these tests permitted the following to be inferred: The frequency of low-energy absorbing strokes up to 4400 Joules, related to two side buffers, is such that an elastic system with a minimum service life of 12 years should withstand this energy as fatigue energy. The frequency of high-energy absorbing strokes up to a maximum of 60,000 Joules, related to two-axled wagons, is low and does not exceed the figure of 60 loadings within 12 years, assuming a mileage of about 25,000 km per annum. The loadings to which the various categories of wagons are exposed are almost the same, and also the influence of the wagon mass is slight.

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International Union of Railways B36/RP 8/E, Apr. 1970, 21 pp, 12 Fig., 1 Tab.

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03 053016

**ELASTIC SYSTEMS FOR TRACTION AND SHOCK GEAR (SIDE BUFFERS AND CENTRE BUFFERS). COMPARISON TESTS OF ELASTIC SYSTEMS FOR THE AUTOMATIC COUPLER**

The report gives an account of all tests made with representatives of the five families of elastic systems: "Friction wedge, not lubricated", "Friction ring,

lubricated", "Rubber springs", "Hydrodynamic compression" & "Hydrostatic compression of elastomers". Static, dynamic, fatigue and train formation tests were carried out, the last, above all, to find an answer to the question whether in trains of irregular composition the level of longitudinal forces can be restricted to 500 kN. Based on the interpretation of the train formation test results it may be concluded that the choice of an optimum elastic system alone would not make it possible to maintain the 500 kN value. Taking into account all test results, it is possible to accept, subject to confirmation by tests yet to be made, the representatives of the families "Friction ring, lubricated", "Hydrodynamic compression" and "Hydrostatic compression of elastomers" into service.

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International Union of Railways B36/RP 14/E, Oct. 1975, 52 pp, 56 Fig., 22 Tab.

ACKNOWLEDGMENT: UIC

### 03 053017

#### USE OF SYNTHETIC MATERIALS AND GLUED CONNECTIONS FOR THE STRESSED PARTS OF LIGHT-WEIGHT ROLLING STOCK. ENQUIRY REPORT

This supplementary Enquiry Report should afford an insight into the most recent state of development of the practical applications of synthetic materials and glued connections on the UIC Member Administrations. Synthetic materials have been introduced on a fairly large scale as accessories of rolling stock (locomotives, passenger coaches and goods wagons). The building of passenger coach bodies of synthetic materials has been suspended for the time being, but several tests are in progress on refrigerator vans with bodies of synthetic materials and tank wagons with tanks of synthetic materials. The attention paid by Railway Administrations to the inflammability of synthetic materials is reflected by the relevant rules and regulations prepared for the internal use of the Administrations.

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International Union of Railways Intrm Rpt. B68/RP 2/E, Mar. 1967, 19 pp, 9 Fig., 7 App.

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### 03 053018

#### USE OF SYNTHETIC MATERIALS AND GLUED CONNECTIONS FOR THE STRESSED PARTS OF LIGHT WEIGHT ROLLING STOCK. ENQUIRY AND FINAL REPORT

This final report contains contributions from six Administrations giving, among other things, detailed descriptions of the present applications of glassfibre-reinforced plastics in railway vehicle construction. These contributions should be of some use in defining the present stage of development but they do not enable any further conclusions to be reached concerning further development. With a view to standardizing the description of the application of synthetic materials and of the experience gained with such materials a special form has been drawn up which the Administrations are recommend to use. The bibliography to the report contains 149 references.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B68/RP 3/E, Oct. 1970, 118 pp, 29 Fig.

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### 03 053034

#### STRENGTH OF UNDERFRAMES. PRELIMINARY REPORT

The rapporteur-Administration (France) sent a questionnaire to the member-Administrations with the object of ascertaining the views and wishes of each of them, and of trying to establish a programme of work. The following Administrations have replied to the questionnaire: Germany, Belgium, Denmark, Spain, Great Britain, Italy, Norway, Netherlands, Portugal, Sweden, Switzerland. The present report is in three parts: correlation of the

replies received to the questionnaire, a summary of problems raised by these replies, and proposals for a programme of work.

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International Union of Railways B7/CR 1/E Prog. Rpt., 16 pp

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### 03 053036

#### STRENGTH OF BODIES OF PASSENGER COACHES. TECHNICAL RECOMMENDATIONS FOR THE CONSTRUCTION OF PASSENGER COACH BODIES INTENDED FOR INTERNATIONAL AND MAIN LINE TRAFFIC

This report deals with the technical recommendations concerning the construction of passenger coach bodies intended for international traffic.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B7/RP 3/E, Nov. 1960, 8 pp

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### 03 053038

#### TEST TO BE CARRIED OUT ON BEHALF OF THE COMMISSION "AUTOMATIC COUPLINGS," WORK OF THE ORE COMMITTEE B 51 UP TO THE 31ST JULY 1962

On May 1st 1960, a call for tenders was addressed to a hundred or so European and non-European firms; Fourteen firms replied to this call for tenders: Four capable of direct coupling with the SA 3-coupler which is used by the USSR Railways, and ten not capable of direct coupling with the SA 3-coupling with the SA 3-coupler. Following a decision of the Board of Management of the UIC in September 1961, those coupler proposals not capable of coupling with the SA 3-coupler were held in abeyance. In the period elapsing since its creation (1958) until July 31st 1962, the Specialist Committee drew up the standard program of tests for the automatic couplers: Part A on test benches, Part B on special test tracks. The following preliminary studies and test were carried out: determination of the influence of the play in the running gear and suspension gear of wagons, with a view to determine the numerical coefficient of reduction to be introduced into the calculations for determining the lateral adjustment values of the test-benches; determination of the optimum length of coupler-shank; determination of the influence of the characteristics of the buffer springs on the functioning of the coupler at small impact speeds. The study of those questions relating to mixed coupling was given priority, since the possibility of the "progressive bringing into operation" of the automatic coupler depended upon the finding of a suitable solution to this problem. Concerning certain of these studies, some provisional results had already been obtained. The tests were being continued. The above-mentioned preliminary tests were able to be made thanks to the stock equipped by the SNCF, the DB, the CFF and the OBB on the occasion of a presentation of some of the proposed couplers to the Members of the General Assembly of the UIC in Paris in December 1961.

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International Union of Railways Intrm Rpt. B51/RP 1/E, Feb. 1963, 13 pp, 16 App.

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### 03 053039

#### TEST ON AUTOMATIC COUPLINGS. WORK OF THE B51 SPECIALIST COMMITTEE FROM JANUARY TO DECEMBER 1966

This report (Report No. 5) describes the studies and tests carried out within the scope of the development of the automatic coupler from January to December 1966, during which period the activities of Specialist Committee B 51 were focused in particular on the following problems: bringing the conditions of UIC Leaflet 522 in line with the latest findings in the development of the automatic coupler; fitting automatic couplers on



locomotives; examining the characteristics of buffing and draw-gear systems during buffing tests at Vitry and at Porta; in collaboration with the Joint UIC/OSJD Sub-group "Studies and tests on the automatic coupler"; fixing the disalignment of the centre of the coupler-head relative to the centre-line of the vehicle, at 15 mm; establishing the rules for the projection of the centre of the coupler-head relative to the buffer plane; extending the conditions for running on ferry boat access-ramps; discussion of all other points on the programme of work, and investigations concerning the fitting and removal of automatic traction and shock appliances, possibilities of straightforward mounting of the simple traction coupler and examination of mixed coupling systems. A considerable proportion of the work of the Specialist Committee consisted in following the compression tests on the track at Vaires in a 150 metre radius curve with adjoining tangent track. The first series of tests showed that the compression forces under which wagons with automatic couplers reached the derailment limit were of the same order as when the same wagons were equipped with screw-couplings and side-buffers. The "Safety against derailment" Group has prepared a note on the derailment of vehicles equipped with the automatic coupler. An important secondary problem in connection with the question of safety against derailment is the reduction of the longitudinal compression forces and reactions in long trains. The calculations made by the NS in this field have provided data which will be invaluable in seeding a solution to this problem. The B 51 Specialist Committee is busy, moreover, with the preparation of "100 coupler tests".

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International Union of Railways B51/RP 5/E, Nov. 1967, 18 pp, 10 App.

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### 03 053040

#### TESTS ON AUTOMATIC COUPLINGS. HUNDRED COUPLER TESTS

The purpose of these tests was to provide data to enable the "Jury" to decide on one of the three locking systems and one of the three suspension systems, with a view to a comprehensive definition of the UIC automatic synthesis coupler. The programme approved by the "Pushing Group" at its meeting on 25th January 1967 covered tests on the geometrical test-bench, tests with individual wagons, running trials, tests in severe weather conditions on a line in Scandinavia and at the Vienna Arsenal climatic Testing Station. The results of the tests were discussed by the B 51 Committee on June 1967, and a report prepared for the "Jury" containing the proposals for completing the definition of the UIC automatic synthesis coupler.

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International Union of Railways B51/RP 6/E, Nov. 1967, 27 pp, Figs.

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### 03 053041

#### TESTS ON AUTOMATIC COUPLINGS. THE CROSS-BEAM AND SLIDING CRADLE SUSPENSION

During 1967 and 1968, development work on the automatic coupler was chiefly concerned with its suspension since its design governs principally the extent of the work involved in preparing the vehicles. The suspension provides the necessary horizontal, vertical and axial freedom of movement and, after uncoupling, centers the coupler. In this report, the design and operation of the cross-beam and sliding cradle suspension are explained and the studies and tests which, in the course of the development work, were conducted to assess design, operating, maintenance engineering and economic characteristics, are described. General and detailed sketches with data of matching dimensions and the space required, spring diagrams, tables and photographs complete the report.

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International Union of Railways B51/RP 7/E, Oct. 1969, 55 pp, 32 Fig.

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### 03 053042

#### TESTS ON AUTOMATIC COUPLINGS. SIMPLE TRACTION COUPLING

This report deals with the application possibilities of the simple traction coupler as a component in the transition from the screw coupler to the automatic traction and shock coupler without side buffers. An elaborate study of the test reports presented by the SNCF, DB, FS and NS has induced the Specialists Committee to conclude that the simple traction coupling, on account of its technical and operational drawbacks and its contestable economy, should not be accepted in international traffic. The Specialists Committee is furthermore of the opinion that the application of the simple traction coupling for the internal traffic of the Administrations should be limited to a minimum and that it should not delay the elimination of the side buffers.

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International Union of Railways B51/RP 8/E, Oct. 1969, 50 pp, 38 Fig.

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### 03 053043

#### TESTS ON AUTOMATIC COUPLINGS. COMPRESSION TESTS ON THE TRACK AT VAIRES FROM 1966 TO 1968. (TEXT, TABLES, FIGURES AND APPENDICES)

The report gives the results of the tests on the track under high longitudinal compressive forces, carried out with a train made up of two-axled wagons equipped with the automatic coupler, with and without side-buffers, on a test section comprising a stretch of tangent track with adjoining curve of 150 m radius, without intervening transition curve. The object of the tests was to determine what was the maximum longitudinal force which could be exerted without a wagon becoming derailed, and this as a function of different parameters such as wheelbase, type of suspension, type of articulation. For comparison purposes, tests with screw-couplings and side-buffers were carried out. The test track, i.e. stretch of tangent track with adjoining curve of 150 m radius without intervening transition curve, was chosen with a view to obtaining unfavourable conditions occurring in practice. The tests have shown that the safety against derailment of two-axled wagons equipped with the automatic coupler without side-buffers is improved: by using an articulation which, in addition to a vertical alignment control system, also possesses a horizontal alignment control system; by increasing, for a wagon of given length exceeding 10 m, the ratio wheelbase/length over buffers. No influence of the type of suspension could be clearly observed. In certain cases, there was an influence, but in other cases this influence was negligible. The results obtained with the screw-coupling and side-buffers have nearly always been better than those obtained with the automatic coupler with and without side-buffers.

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International Union of Railways B51/RP 9/E, Oct. 1969, 99 pp, 38 Fig., 16 Tab., Apps.

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### 03 053044

#### TESTS ON AUTOMATIC COUPLINGS. COEFFICIENT OF REDUCTION K (TESTS MADE IN 1968-1969)

The possibility of coupling vehicles with an automatic coupler, reliably and without outside help, is governed strictly by the fields of action of the coupler heads and their position in relation to each other during coupling. This report contains an account of the tests and studies which served to ascertain one factor, the coefficient of reduction k, which will be multiplied by the value of the maximum theoretically possible transverse play in the running gear parts of the vehicles and of that in the track, so as to obtain the maximum transverse play likely to be encountered in service. Based on the tests mean values of k are proposed for application to the entire freight rolling stock. These values were selected taking into account the most important parameters (two-axle wagons, bogie wagons, long suspension short suspensions (or suspensions with a load-dependent friction damper for bogie wagons). Taking into account the transverse plays reduced by

coefficient  $k$  to values acceptable for the calculations, it is possible to establish (see UIC Leaflet 530, formula in section III.3c) for a horizontal field of action (220 mm) of the automatic coupler a simply applied and realistic limit ratio between the principal dimensions of a vehicle (total length and wheelbase or distance between bogie pivots).

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International Union of Railways B51/BP 10/E, Apr. 1970, 61 pp, 12 Fig.

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### 03 053045

#### TESTS ON AUTOMATIC COUPLINGS. TEST WITH AUTOMATIC COUPLERS OF THE UIC 1969 TYPE (ADAPTED BY THE UIC AND BY THE OSSHD-IMPROVED MANUFACTURING PROCEDURE)

Following tests over several years with various automatic couplers, the UIC 1969 type was developed. This coupler meets the conditions of UIC/OSSHD Leaflet No. 522 and is suitable for coupling with the OSSHD coupler. Joint tests were carried out at the beginning of 1970 with UIC 1969 coupler-heads taken from the first manufacturing batch, and with OSSHD couplers. The tests described in the present report were requested by the UIC and were carried out with couplers manufactured in the second half of 1970. The tests took place from November 1970 to January 1971. It was found that the defects observed during the "joint tests" with the UIC 1969 couplers were not of a fundamental nature and that it had been possible in the meantime to eliminate these. Furthermore, it had also been possible to introduce several improvements: a new electric line connector showed an excellent performance during all these tests. The principle of the ability to couple with the OSSHD automatic coupler has been ensured in all cases. Summing-up, it can be stated that the UIC coupler of the 1969 type had shown a very satisfactory performance during these tests.

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International Union of Railways B51/RP 11/E, Apr. 1971, 29 pp, 16 Fig.

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### 03 053046

#### TESTS ON AUTOMATIC COUPLINGS. WORK OF THE COMMITTEE FROM JANUARY 1967 TO DECEMBER 1969

The work of the Specialists Committee in the period covered by the present report from January 1967 to December 1969 is essentially characterised by: the carrying out and the evaluation of the "hundred coupler tests" (ORE-report B 51/RP 6), the preparatory work for the UIC delegation, forming part of the "UIC-OSJD Technical Working Group for the automatic coupler", with a view to defining the characteristics of the UIC/OSJD suspension (ORE-report B 51/RP 7), and including the drawing relating to the preparation of wagon underframes, the studies having led the Committee to recommend against accepting the simple traction coupler for use in international traffic (ORE-report B 51/RP 8), the preparation and carrying out of tests with mechanical mixed coupling systems and intermediate pieces, and the continuation of the study on the whole of the complex problem "riding stability of vehicles equipped with automatic couplers" (ORE-report B 51/RP 9).

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International Union of Railways B51/RP 12/E, Oct. 1971, 70 pp, 60 Fig.

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### 03 053047

#### TESTS ON AUTOMATIC COUPLERS. TESTS WITH THE GLK 2 MIXED AIR COUPLINGS

This report contains the results of tests with mixed air couplings of type GLK 2 which included: the assessment of the mixed air coupling regarding type and design, coupling and uncoupling tests in the straight and on curves,

impact tests, trials in train formation, trials on the hump, and assessment from the standpoint of shunting. Mixed air couplings of type GLK 2 were tested using the following combinations of couplings: screw coupling GLK 2 coupled with screw coupling current type of coupling head, screw coupling GLK 2 coupled with screw coupling GLK 2, mixed mechanical coupling GLK 2 coupled with the UIC automatic coupler, and SA 3 coupler GLK 2 coupled with the UIC automatic coupler. The mixed mechanical couplings of the: German Federal Railway (DB type), and Societe General Isothermos (Unitendeur UT 70 type) were used for the tests. The results of the tests led to the conclusion that the device tested is suitable to solve the problem of mixed air couplings between a vehicle equipped with the screw coupling and one equipped with the automatic coupler for a limited transition period. Since the device can be inserted in the automatic coupler from one side only, it is recommended that, for operating reasons, it be used only temporarily.

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International Union of Railways B51/RP 16/E, Apr. 1975, 54 pp, 9 Fig.

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### 03 053048

#### TESTS WITH AUTOMATIC COUPLERS. TESTS ON FERRY-BOATS IN 1971 AND 1973 WITH THE AUTOMATIC COUPLER

The report provides information on the tests made by the DSB, in 1971 and 1973, shunting wagons and passenger coaches which were equipped with the automatic coupler on and off ferry-boats. The investigations, which had been made on both older ferry-boats (outer tracks with 120 m curves) and more recent ones (outer tracks with 150 m curves, and larger ones), served to determine whether it was possible to move vehicles equipped with automatic coupler aboard ferry-boats in the same way as vehicles equipped with the screw coupling were currently being moved. The different tests made, which are described in this report, led to the conclusion: that vehicles equipped with the automatic coupler, without side buffers, enabled shunting operations on and off ferry-boats to be performed readily and that, in comparison with the currently used screw coupling, they even facilitated such operations; and that operating vehicles equipped with the automatic coupler and side buffers or the use of the mixed coupling system (vehicles equipped with the screw coupling being coupled with those equipped with the automatic coupler with the aid of mixed coupling devices in the presence of side buffers) required, in addition to the intermediate boards, currently used in certain cases, other aids in the shape of intermediate pieces. The state of development of these expedients, which will be required for a limited transition period, is set forth and recommendations are given for their further development.

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International Union of Railways B51/RP 17/E, Apr. 1975, 24 pp, 7 Fig., 3 Tab.

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### 03 053049

#### CARRIAGE AND RAILCAR HEATING. REPORT ON THE TESTS, MADE DURING THE WINTER 1957/58, TO DETERMINE THE STEAM CONSUMPTION REQUIRED FOR THE HEATING OF CARRIAGES

The B 30 Specialists Committee had been entrusted with the task of determining, by means of tests, the values indicative of the steam consumption for the heating of various types of carriages equipped with various systems. The tests were carried out on the lines of the DB, at the request of the B 30 Specialists Committee, by the Carriage and Wagon Testing Department of the DB at Minden (Westphalia) (1958). Three test trains, each consisting of 9 coaches of the same type, were formed; the average consumption values of each coach were then measured, by measuring, under relatively unfavourable service conditions (night journeys, unoccupied compartments), the total consumption of each test train.

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International Union of Railways Intrm Rpt. B30/RP 3/E, July 1959, 20 pp, 28 App.

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03 053050

**CARRIAGE AND RAILCAR HEATING. REPORT ON THE TESTS DETERMINING THE CURRENT CARRYING CAPACITY OF COUPLING COMPONENTS AND MAIN THROUGH WIRING FOR ELECTRIC TRAIN HEATING, CARRIED OUT DURING THE YEAR 1959**

The B 30 Specialists Committee had been entrusted with the task of determining, by means of tests, the current carrying capacity of the main through wiring and couplings for electrical train heating and of making proposals as to the means by which this capacity might be increased. The need for this investigation arises from the fact that the carrying capacity of existing wiring and couplings is, in some cases, appreciably lower when the electric supply is alternating at 50 cps than when it is at 16-2/3 cps or is direct current. In addition there is an increasing tendency for some vehicles to have an installed heating capacity greater than 35 kW, even at 1000 volts supply voltage and some Administrations are already operating trains of more than 15 vehicles and others are proposing to do so. The tests were carried out during 1959 by the Testing Station of the DB Electrotechnical Department in Munich, using well established techniques approved by the B 30 Specialists Committee. The tests showed that in general all present types of wiring and couplings could carry 600 Amps. at 16-2/3 cps or with D.C., but that this was reduced in some cases to rather over (in one instance under) 400 Amps. at 50 cps due to some part or other becoming too hot. It was also found that by making various parts of non-magnetic, instead of magnetic, material and by using cables with heat resisting insulation the current carrying capacity could be increased to 700 Amps.

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International Union of Railways Intrm Rpt. B30/RP 5/E, Nov. 1960, 10 pp, 21 App.

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03 053051

**CARRIAGE AND RAILCAR HEATING. REPORT ON THE TESTS CARRIED OUT ON SOME STEAM HEATING HALF-COUPLINGS IN 1956-1957-1958 AND 1959 BY VARIOUS DEPARTMENTS OF THE DB AND OF THE SNCF**

The investigation which is covered by this report arose from the need to improve the performance in service of the rubber washers used in the heads of steam heating couplings as failures of these components were responsible for about half the total number of "incidents" concerned with steam heating. While the performance of such washers could be improved to some extent by an improvement in the quality of the washers themselves any such improvement was found to be of a severely limited amount if the design of the coupling to which it was fitted was such as to give rise to criticism both as regards the mounting of the washer in the coupling head and as regards the flexibility, or stiffness, of the joints. No proper comparison could be made of the performance of the various washers tested for endurance on a testing machine, simulating the movements of the couplings in service, unless the couplings, in which the washers were mounted, were themselves similar in performance. This led to tests on a variety of couplings, from several Railway Administrations, some of which were found not to comply fully with the requirements of UIC Leaflet No. 551. These tests showed that the Friedmann type of coupling, used by the DB and other railways, met the requirements better than the other couplings tested and enabled a very much longer life to be obtained from the washers. As a result of the tests two proposals are put forward: (a) the draft of an amended text for UIC Leaflet No. 551; (b) the draft of a Technical Specification for the supply of rubber washers and joint rings for steam heating couplings. These two proposed drafts form appendices to the report.

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International Union of Railways Intrm Rpt. B30/RP 6/E, Nov. 1960, 26 pp, 2 App.

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03 053052

**CARRIAGE AND RAILCAR HEATING. REPORT ON THE STEAM CONSUMPTION FOR THE HEATING OF CARRIAGES BY MEANS OF AIR-HEATING SYSTEMS**

No Abstract.

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International Union of Railways Intrm Rpt. B30/RP 7/E, Nov. 1960, 7 pp, 1 App.

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03 053053

**CARRIAGE AND RAILCAR HEATING. REPORT ON TESTS OF DEVICES FOR AUTOMATIC VOLTAGE SELECTION FOR ELECTRICAL TRAIN HEATING AT SEVERAL VOLTAGES**

No Abstract.

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International Union of Railways Intrm Rpt. B30/RP 8/E, Jan. 1961, 6 pp, 2 App.

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03 053054

**CARRIAGE AND RAILCAR HEATING. CONSUMPTION OF ELECTRIC ENERGY FOR THE HEATING OF CARRIAGES. (DIRECT HEATING OF HEATING BY MEANS OF THE FORCED OR MODULATED AIR SYSTEM) (SNCF-ROLLING STOCK, WINTER 1958/59)**

The report gives the results of tests carried out early in 1959 on behalf of ORE by the SNCF using its own carriages, of several different kinds, to determine the electrical energy needed for train heating with each of a number of different kinds of heating system, control system and kind of vehicle. A train of nine carriages was run between Paris and Lyons and back a number of times, both empty and in ordinary commercial service, on stopping trains. Some stationary tests were also carried out with this train. The report brings out the difficulties, due to both natural and other causes, when tests are carried out on the line either with special trains or in ordinary commercial service. On several occasions the weather was very mild and occasionally, in sunshine, actually hot, so that the heating had sometimes to be turned off. The occupation of the different vehicles by passengers was very varied and the actions of the passengers affecting the heating were unrepresentative because of the unusual weather. To obtain really good comparative figures either a very large number of tests in service are needed or use must be made of a testing station such as that now in service at Vienna, but which was, at the time of these tests, only in the very early stages of construction. The report brings out the fact that the more modern types of heating with a forced air circulation, constant or intermittent, requires more energy than the older heating by radiators mainly because of the improved ventilation which these air heating devices provide when the train is stationary or moving at low speed (for passenger trains). This excess reached almost 100% in the most adverse and abnormal circumstances but was more often in the order of 30-40% for these tests and it is estimated that in express service the difference would be in the order of 10-15%. The question of preheating is also dealt with and the important point is brought out that speed of preheating and economy of preheating energy are not altogether compatible with one another or with economy when the train is running. The report also shows that the system of heating of a carriage cannot be considered in isolation but must be considered together with the constructional characteristics of the carriage itself.

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International Union of Railways Intrm Rpt. B30/RP 9/E, July 1961, 31 pp, 13 App.

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03 053055

**CARRIAGE AND RAILCAR HEATING. ENERGY CONSUMPTION FOR HEATING SYSTEMS WITH AND WITHOUT THERMOSTATIC REGULATION**

This report is, in effect, a summary of reports made to ORE by the DB and by the SNCB on some tests carried out for ORE by those two Administrations, using carriages of the SNCB to determine the economy in the consumption of electrical energy for train heating when automatic (thermostatic) control is substituted for hand operated control of the heating. In addition the report includes the results of similar tests made by the DB, on its own account, with its own carriages, and described in its own report. The tests covered 460 heating days in all and were spread over most of two heating seasons and took place in conditions representative of average weather conditions in Central and Western Europe. The average economy was found to be 22.5%. The value of this saving in money depends on so many factors, varying from one Administration to another, that no generally applicable value can be stated, but the data given will permit any Administration to make an estimate to suit its own circumstances. This saving can be set against the additional cost of fitting automatic control to new carriages, which usually so fitted for reasons of increased passenger comfort, or against the cost of converting existing carriage stock, which cost may vary greatly for different Administrations.

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International Union of Railways Intrm Rpt. B30/RP 10/E, July 1961, 8 pp, 1 Tab., 1 App.

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03 053056

**CARRIAGE AND RAILCAR HEATING INFLUENCE OF THE RELATIVE AIR HUMIDITY ON THE DESIGNING OF THE COOLING PART OF AIR CONDITIONING PLANTS IN PASSENGER COACHES**

The present report deals with the influence exerted by the cooling and dehumidifying of the outside air which is introduced by the air conditioning plant on the design of the cooling portion of the latter. This report is based on a very large mass of meteorological data which represent the climatic conditions in two cities (Bonn and Barcelona). These two cities represent, on one hand, the climate of Central Europe (and much of Western Europe also) and, on the other hand, that of the European coast of the Mediterranean. The worst combination of temperature and relative humidity of the air for each of these climates has been used as a basis of calculation excepting only those occasional extremes that occur, on average, for only about one hour per year. It appeared that as regards both climates, the maximum output for cooling and dehumidifying of the outside air would be required at an ambient temperature of about 29 degrees Centigrade. The relative humidity decreased so rapidly at higher temperature that the cooling output diminished again. The total cooling output of an air-conditioning plant intended to achieve those conditions of comfort in a railway carriage which have been set out in Interim Report ORE B 30/RP 4, part I, is a function of the influence of heat transfer, solar radiation, emission of heat by passengers and cooling and dehumidifying of outside air introduced by an air conditioning plant. The first three causes of influence have been dealt with by Interim Report ORE B 30/RP 4, part II, and the fourth cause is the subject of the present report, which therefore represents a supplement to Interim Report RP 4. A summary of the total cooling output as a function of the ambient temperature and the rate of occupation of the vehicles, was given in Interim Report ORE B 30/RP 11, section 2.6. For this results of Interim Reports RP 4 and RP 12 were used.

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International Union of Railways Intrm Rpt. B30/RP 12/E, July 1962, 12 pp, Apps.

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03 053057

**CARRIAGE AND RAILCAR HEATING. REPORT ON THE TESTS CARRIED OUT IN THE VIENNA ARSENAL TESTING STATION DURING 1961**

This report sums up the results of the tests carried out in the Vienna Testing Station during 1961 on 9 railway coaches belonging to various Administrations. Vehicles of the following types were tested: open central-gangway saloon coach, compartment coach, couchette coach, diesel railcar and air-conditioned TEE trailer coach. Although the heating systems differed from each other the tests carried out were in many ways similar for all vehicles. These tests were firstly concerned with the determination of the time required and the corresponding energy consumption for preheating from various outside temperatures. Subsequently, the quality of the heat regulation was tested, the energy consumption necessary for heating at various speeds determined and comfort tests carried out which chiefly covered temperature distribution in the compartments and air circulation velocities. In addition were carried out: cooling tests and tests appertaining to the resistance of the equipment to freezing and overheating; k-value tests supplemented by tests for measuring air leakage by means of radio-active isotopes introduced into a vehicle and Geiger-Muller counters; special tests to meet specific requests of various Administrations. The most important results obtained in these series of tests are summarised and graphically illustrated. It is regretted that it has not so far been possible to present in this first report an analysis and a comparison of the results of the different tests. It is, however, intended to supplement accordingly the annual report for 1962.

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International Union of Railways Intrm Rpt. B30/RP 13 /E, Oct. 1962, 71 pp, 24 Fig., 19 Tab.

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03 053058

**CARRIAGE AND RAILCAR HEATING. LIABILITY OF THE WATER SUPPLY SYSTEM OF RIC-COACHES TO FREEZING**

The prescriptions contained in RIC par. 43 and those in UIC-leaflet 563, both issued on 1st January 1962, deal with the conditions to be met by water supply systems for RIC-coaches in respect of their liability to freezing. These prescriptions are not in accordance with each other and, in the opinion of the ORE B 30 Specialists Committee, they do not entirely allow either for the demands of the passengers nor for those pertaining to operation. Therefore, a new text of the above prescriptions is suggested. The conditions to be fulfilled for the technical realisation of these proposals have been investigated. During this it has become apparent that unheated passenger coaches may be left, without any heating of the water, in the open air for periods up to 12 hours, even at a temperature of -20 degrees C, when merely taking simple measures to ensure an adequate insulation. As the measures to achieve this insulation can, generally speaking, be applied to coaches of older designs, it is suggested that from a certain date, still to be fixed, only such RIC-coaches should be accepted in which the water need not be drained when these coaches are left unheated in the open air for periods up to 12 hours. The heating of the water for toilets and lavatories is then not required in order to protect the water tank against freezing. It is however recommendable both for reasons connected with comfort and to prevent the formation of ice in the drain pipes of the water supply devices. The methods of heating the water adopted so far are summarised. A test procedure which can be applied in the Vienna testing installation is described; this will make it possible to determine, in future, whether passenger coaches meet the conditions for the water supply systems for toilets and lavatories as proposed in this report. The theoretical cooling curves of the water at the various initial conditions occurring in practice were plotted by the Bundesbahn-Versuchsanstalt Minden (Westph.) by means of an analogue computer. The original report of this research organisation has been appended to the report. The theoretically determined cooling curves, reproduced in this report, will in due course be supplemented by results which have been obtained during practical tests made in the Vienna Test Installation.

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International Union of Railways Intrm Rpt. B30/RP 14/E, June 1963, 13 pp, 1 App.

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03 053059

## CARRIAGE AND RAILCAR HEATING. TESTS CARRIED OUT IN THE VIENNA ARSENAL TESTING STATION DURING 1962

The present report is a summary of the results of tests carried out in the Vienna Testing Station in 1962 on 21 railway coaches belonging to various Administrations. Vehicles of the following types were tested: Open central-gangway saloon and compartment coaches, couchette coaches, diesel railcars or driving trailer coaches, and also air-conditioned coaches of luxury trains. Although the heating systems differed, it was tried to carry out the same tests on all vehicles. The tests covered first the determination of the pre-heating and pre-cooling periods and that of the energy required for these processes at various outside temperatures. Subsequently, the quality of the regulation of the heating or air-conditioning equipment was tested and the energy consumption of the heating or air-conditioning equipments ascertained at various outside temperatures and speeds; comfort tests were also carried out. The latter chiefly covered the temperature distribution and the air circulation velocities in the compartments. Furthermore, cooling tests were made and also tests for ascertaining the resistance of the equipment to overheating and freezing. A series of k value tests were made with the vehicles at different operating conditions and at various wind velocities. These tests were supplemented by air leakage measurements, using radioactive isotopes. Finally, special tests, such as noise measurements, were made to meet specific requests of various Administrations. The most important results obtained from these series of tests are summarised by means of graphs. For the purpose of comparison, the respective extreme values of the test results of 1961 have been added. The tables and graphs are followed by a summary of the different series of tests and, in this connexion, the results of the different tests are reviewed.

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International Union of Railways Intrm Rpt. A30/RP 15/E, Oct. 1963, 137 pp, 37 Fig., 19 Tab.

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03 053060

## CARRIAGE AND RAILCAR HEATING. OIL BURNER TRAIN HEATING SYSTEMS

ORE Committee B 30 is studying the possibilities of heating railway carriages and has in consequence examined oil-fired heating systems. A survey on the oil burner heating systems used on rail vehicles of the West European Railways shows that for diesel rail buses and similar vehicles, for battery railcars, trailers and driving trailers, use is made of oil burner water and air heating devices of simple design with an output of 6500-18,000 kcal/h. On larger vehicles oil burner heating systems with pressure-fed oil atomisers in combination with hot water boilers or air heaters of 35,000 -60,000 kcal/h output are used. In diesel railcars, the warm coolant water of the engines is largely used for heating purposes; this also provides the possibility of keeping the coolant water of the engine warm by means of the vehicle heating plant and of pre-heating it to the starting temperature of the diesel engine. On Administrations where a large percentage of the system is electrified there is a tendency to replace steam heating boilers on diesel locomotives and heating vans by electric heating generators so that, in future, passenger coaches may be heated exclusively by electricity and steam heating systems might be dispensed with. A special chapter has been devoted to oil burner individual coach heating systems for general purpose passenger coaches running in locomotive hauled trains. Also studied were the frequency failure rates of oil burner heating systems, safety regulations for in tunnel passing by rail vehicles discharging exhaust gases produced by oil-fired heating plants, and annual expenditure of the oil burner heating systems.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B30/RP 16/E, Oct. 1964, 24 pp, 6 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053061

## CARRIAGE AND RAILCAR HEATING. PROVISIONAL TECHNICAL SPECIFICATION FOR THE SUPPLY OF RUBBER ARTICULATION JOINTS FOR STEAM-HEATING HALF COUPLINGS

Following the meetings held at ROME in January 1961, the Sub-Commission "Specifications and Standardisation" considered that the draft-specification for washers and articulation joints for steam heating half-couplings, presented by the B 30 Committee in its Interim Report No. 6, should only be retained for the washers. This draft-specification was consequently submitted to the 5th Commission of the UIC in the form of UIC Leaflets comprising a technical specification of a provisional nature. This led to the publication, on 1st January 1962, of UIC Leaflet 841-3 R. Concerning the articulation joints, the B 30 Committee was asked to prepare a document defining, in a more precise manner, the qualities required of these components. This work has just been completed and the document, established in the same form of layout as Leaflet 841-3 R, defines better the test conditions especially applicable to articulation joints, namely: hardness tests, tensile tests, adherence tests and checking of the consistency of the shape. This new specification takes into account data taken from the studies of the B 30 Committee and from different acceptance tests on articulation joints, carried out in the laboratory. The application of the envisaged prescriptions should result in an improved performance in service and by an increase of effective life. Consequently, a reduction in the number of failures in service and a decrease in maintenance costs might be expected.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B30/RP 17/E, June 1964, 14 pp, 3 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053062

## CARRIAGE AND RAILCAR HEATING. TRIALS ON HEATING CUT-OFF COCKS WITH LEAKAGE HOLES TO AVOID FREEZING OF THE MAIN STEAM PIPE

In UIC-leaflet No. 551, article 11, it was laid down that in the case of newly built rolling stock, the steam cut-off cocks of the main steam pipe, as from 1st January 1962, must possess, in addition to "open" or "closed" positions, an appropriately marked position which can be used for releasing steam at the rear of the train through an opening with a minimum cross section of 1.5 mm to the 2nd power. In a relevant footnote it has been stated that the cross section of the leakage hole may still be changed when more accurate tests have been made. Within the scope of the tasks entrusted to it by the ORE Control Committee, the B 30 Specialists Committee has studied, by means of tests in the Vienna Arsenal Testing Station, the behaviour of the steam discharged from leakage holes at several steam pressures down to minus 20 degrees centigrade and assembled the results in this report. Simultaneously, the behaviour of the discharged steam from a steam leakage hole in the end-cap of a new suspension device and the results were compared with those of the steam cut-off cock.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B30/RP 18/E, Oct. 1964, 10 pp, 12 Fig., 2 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053063

## CARRIAGE AND RAILCAR HEATING. TESTS ON FILTERS FOR PASSENGER COACHES

The problems of the filtering of air in the air heating and air conditioning installations of passenger rolling stock is at present resolved in various manners by the different Administrations, but with results which are not completely satisfactory. The choice of a filter is governed by a certain number of factors such as: electrical power available for the fan, the power required being a function of the air flow and the pressure drop, quality of the filtration, and maintenance questions (frequency, cost). Certain of these factors are contradictory, which leads almost inevitably to a compromise

solution and explains the various difficulties encountered up to present in order to achieve the filtering of air under optimum conditions. The Committee B 30 of ORE has entrusted the SNCF with the carrying out of comparative laboratory tests with different types of filters, some of which are already fitted on air-heated or air-conditioned carriages and others which have not yet been placed in service. These tests form the subject of the present report.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B30/RP 19/E, Feb. 1965, 18 pp, 21 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

### 03 053064

#### CARRIAGE AND RAILCAR HEATING. TESTS WITH THERMOSTATS AND CONTACT THERMOMETERS

This report gives an account of the tests carried out with six thermostats and four contact thermometers which might be considered to be representative of the devices used by the Western European railways for regulating the temperature of passenger coaches. The object of the tests was: to examine the characteristics of the devices when new, to submit them to an artificial aging similar to a period in service in a coach of two years, and to re-examine the characteristics of the devices after aging. It became apparent that: the switching-on and switching-off temperature of certain devices had changed; aging did not exert an influence with an appreciable tendency on the switched-on and switched-off times of thermostats with thermal feed-back; and the thermal inertia of the thermostats which underwent the complete aging test had increased. The extent of these variations is shown in the tables and diagrams. It is felt that it is necessary to draw special attention to the aim of the tests which was to ascertain the properties of the thermostats from that standpoint of the regulating technique and their modification as a function of the time. Since only one specimen of each thermostat type could be tested, the tests do not therefore provide any information about the reliability of these thermostats in service.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B30/RP 20/E, June 1965, 16 pp, 9 Fig., 4 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

### 03 053065

#### CARRIAGE AND RAILCAR HEATING. TESTS WITH TEMPERATURE REGULATING DEVICES

This report gives an account of the tests carried out with two temperature regulating devices used by the Western European railways for regulating the temperature of passenger coaches. The object of the tests was: to examine the characteristics of the devices when new, to submit them to an artificial aging similar to a period in service in a coach of two years, and to re-examine the characteristics of the devices after aging. It became apparent that: aging did not exert an influence with an appreciable tendency on the operation of the temperature regulators; the thermal inertia had not changed. It is felt that it is necessary to draw special attention to the aim of the tests which was to ascertain the properties of the regulating devices from the standpoint of the regulating technique and their modification as a function of the time. Since only one specimen of each type could be tested, the tests do not therefore provide any information about the reliability of these regulating devices in service.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B30/RP 21/E, Mar. 1966, 13 pp, 6 Fig., 2 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

### 03 053066

#### CARRIAGE AND RAILCAR HEATING. SUMMARY OF THE WORK DONE BY THE COMMITTEE AND RECOMMENDATIONS FOR THE DESIGN, CONSTRUCTION AND OPERATION OF HEATING AND AIR-CONDITIONING EQUIPMENT

A short introduction to, and a description of, the field of research entrusted to the B 30 Specialists Committee precede an account of the field trials during the years 1955 to 1957, which is given in Chapter 1. The results of these trials show that useful and comparable tests can be made only in a permanent test installation and that the conditions of comfort to be met by heating and air-conditioning equipment still require to be specified. The factors influencing conditions of comfort are defined in Chapter 2, and Chapter 3 contains proposals for technical improvements. Determination of energy consumption is described in Chapter 4, and an account of the investigation to ascertain the liability of freezing of water supply systems in passenger coaches is given in Chapter 5. A detailed description of the problems arising from the use of oil-fired heating systems is given in Chapter 6 and a similar one of the problems due to air-conditioning equipment in Chapter 7. The establishment of the Vienna Arsenal testing station is described in Chapter 8. A review of the results obtained from tests with the latest heating and air-conditioning equipment in the Vienna Arsenal testing station is given in Chapter 9. The design of both types of equipment was based on the preliminary work of the B 30 Specialists Committee. Recommendations for the design and construction of heating and air-conditioning equipment are set forth in Chapter 10, which also contains an outline of the future development of this equipment. Chapter 11 consists of the final observations.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B30/RP 22/E, Oct. 1966, 24 pp, 9 Fig., 3 Tab., 2 App.

ACKNOWLEDGMENT: UIC  
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### 03 053070

#### STUDY OF THE CONTINUOUS OR DISCONTINUOUS DRAW GEAR OF WAGONS. ENQUIRY REPORT

In March 1955 the ORE Bureau was entrusted by the Control Committee to proceed with a documentary enquiry of the question, which, after approval by the Board of Management in December 1955, was placed on the programme of work of ORE under the following number and title: "B 33: Study of the continuous or discontinuous drawgear of wagons". The problem was submitted to the ORE Control Committee by the Swiss Federal Railways (CFF), who, by means of tests, had obtained fresh evaluation data with regard to this old question and who, consequently, suggested that ORE should proceed with a careful comparison of the two systems used at present in Europe for the drawgear equipment of wagons. The ORE Bureau simultaneously carried out the enquiry in two different fields; by studying minutes and reports of international organisations dealing with the question at the time, thus making it possible to obtain an overall picture of the history of the question, necessary in order to understand the present position of the question; by carrying out an enquiry by means of a questionnaire and completed by verbal information obtained from certain Administrations giving their national point of view. In addition to this ORE engineers participated in a series of tests which were carried out in 1955 by the CFF. The present report summarizes the results of the studies. These two parts of the enquiry, is divided into the following 4 chapters: I. Historical review of the question; II. Summary of the enquiries made with the Administrations; III. Concise report of the tests carried out by certain Administrations; and IV. Conclusions and suggestions. In addition, the report contains 7 enclosures.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B33/CR 1/E, May 1956, 36 pp, 2 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP



03 053071

**COMPARATIVE STUDY OF CONTINUOUS AND DISCONTINUOUS DRAWGEAR OF WAGONS. (TEXT, ENCLOSURES A1 TO D77)**

The B33 Specialists Committee having been asked to undertake a comparison between the continuous and discontinuous drawgear systems of wagons so as to arrive at a recommendation as to the drawgear system to be adopted for the wagons of the future, simultaneously carried out two distinct studies, viz. a study based on experiments, which was expected to provide the essential arguments in favour of one or the other solution, and an economical study. The economical study was concerned with the following items: weights of the various drawgear parts, net construction costs, maintenance costs in service. This study, which has necessitated a very prolonged research, is still in progress. The main object of the experimental study was to determine the influence of the type of drawgear system on the conditions under which starting and braking of trains took place, especially when heavy and very long trains were involved. Endeavours were made to carry out as complete a series of experiments as possible, by varying the test conditions: load of train in front or at the rear, tight or loose couplings, normal or short filling time for the brake cylinders etc. Moreover, the tests for determining the maximum loads capable of being started, carried out at first with trains provided with roller bearings, were repeated with trains provided with plain bearings. The braking tests were carried out successively with normal type buffers (with volute springs) and with buffers with a high absorption capacity (ring springs). The conclusions that could be drawn from these comparative tests showed appreciable differences, because the results obtained varied within wide limits, as did the test conditions. Finally, it will be necessary to draw on the results of the economic study. The problems which might arise through the adoption of automatic coupling, will also have to be taken into consideration.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Inrm Rpt. B33/RP 1/E, July 1959, 44 pp, Figs., Apps.

ACKNOWLEDGMENT: UIC  
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03 053073

**STUDY OF THE CONTINUOUS OR DISCONTINUOUS DRAWGEAR OF WAGONS. ECONOMIC STUDY AND GENERAL CONCLUSIONS**

The purpose of the present report is to give an account of the results of the economic study and, subsequently, to frame general conclusions issuing from all the studies carried out by the Committee. This economic study, carried out by Working Group "Wagons", has concerned the following questions: the weight, the prime construction costs, and the maintenance cost in service.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Inrm Rpt. B33/RP 2/E, Jan. 1961, 23 pp

ACKNOWLEDGMENT: UIC  
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03 053179

**STANDARDISATION OF LARGE CONTAINERS AND CONTAINER WAGONS. TECHNICAL SPECIFICATIONS FOR INTERMEDIATE PIECES FOR USE IN THE CARRIAGE OF TWO STACKED LOW-HEIGHT CONTAINERS**

In the present report conditions are defined, which must be fulfilled, if the carriage by rail of two stacked low-height containers is to be approved. Especially detailed consideration is devoted to the acceptance conditions for the intermediate pieces to be used. By reference to strength tests the report shows the feasibility of producing such intermediate pieces. In conclusion, the report gives recommendation for the carriage of low-height stacked containers in service.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 112/RP 14/E, Apr. 1976, 26 pp, 9 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053186

**STANDARDISATION OF TRANSCONTAINERS AND TRANSCONTAINER WAGONS. STUDIES OF THE COMMITTEE DURING 1968 IN CONNECTION WITH THE STANDARDISATION OF WAGONS AND THEIR LOCATING AND SECURING SYSTEMS**

This report gives a survey of the various documents which may be of importance for the further development which may be of importance for the further development of transcontainer wagons. In view of the short time having elapsed between the actual start of the studies and the research still in progress concerning the definition proper of certain special features of the conveyance, the present report does not contain entirely exhaustive and definite solutions. However, in view of the urgency of this question and the fact that some Administrations would seem to intend building such wagons at more or less short notice, the committee has thought it appropriate to summarize and to publish the results of its studies so far. The technical considerations resulting from this could thus lead to a closer correlation between the studies and designs now being made and the standard solutions, which will certainly not be available for some time.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 112/RP 1/E, Apr. 1969, 78 pp, 14 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053187

**STANDARDISATION OF TRANSCONTAINERS AND TRANSCONTAINER WAGONS. STANDARDISATION OF CORNER CASTINGS FOR TRANSCONTAINERS**

The report contains specifications for corner castings, and drawings of them. For the definition of the standard design many points of view were considered, such as stocking, handling, stowing on means of transport, stresses and strains, shape, and manufacture. Sixteen organisations, the majority of them being railway administrations, contributed to the preparation of the report.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 112/RP 2/E, Apr. 1969, 11 pp, 2 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053188

**STANDARDISATION OF TRANSCONTAINERS AND TRANSCONTAINER WAGONS. STANDARDISATION OF TRANSCONTAINER WAGONS FOR LINER-TRAINS: WAGONS WITH TWO BOGIES AND WITH AN EFFECTIVE LOADING LENGTH OF 60 FT (18.400M). WAGONS WITH THREE BOGIES AND WITH AN EFFECTIVE LOADING LENGTH OF 80 FT (26.000M). STANDARDISATION OF LOCATING AND SECURING SYSTEMS**

This report forms the continuation of Report B 112/RP 1 of April 1969. It describes in particular the result of the studies of ORE Specialists Committee B 112 concerning bogie-type transcontainer wagons for liner-trains and shows how a fundamental modification with regard to the loading-gauge permits the designing of transcontainer carrying wagons with normal buffing height, suitable for taking the automatic coupler. In the Report the characteristics of the two wagons are laid down: the transcontainer wagon with two bogies and with an effective loading length of 60ft (18.400 m), and the transcontainer wagon with three bogies and with an effective loading length of 80 ft (26.000 m) and proposes a locating and securing system using for the transcontainers, ISO and Sea-Land locating pins, the housing-sleeve of which can take either type of pin.

Restrictions on the use of this document are contained in the explanatory material.



International Union of Railways B112/RP 3/E, Oct. 1970, 41 pp, 10 Fig., 3 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053189

**STANDARDISATION OF TRANSCONTAINERS AND TRANSCONTAINER WAGONS. SPECIFICATION FOR TRANSCONTAINERS OF CATEGORY 20/8-ISO 1C. STANDARD DESIGN FOR NORMAL, CLOSED CONTAINERS**

The specification is split up into 5 parts: General, Specifications, Technical Requirements, Testing and Acceptance.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B112/RP 4/E, Oct. 1970, 24 pp, 1 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 053190

**STANDARDISATION OF TRANSCONTAINERS AND TRANSCONTAINER WAGONS. SPECIFICATION FOR TRANSCONTAINERS OF CATEGORY 40/8-ISO 1A. STANDARD DESIGN FOR NORMAL CLOSED CONTAINERS**

The subject of the report-the specification-is limited, as far as statements are given, to the study and construction of ISO-transcontainer prototypes of the Railway Administrations and their subsidiaries. The technical requirements and the testing and acceptance conditions and also some general requirements given in the specification exceed the conditions laid down in the existing international prescriptions (ISO recommendations, UIC Leaflets).

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B112/RP 5/E, Oct. 1971, 25 pp, 1 App.

ACKNOWLEDGMENT: UIC  
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03 053191

**STANDARDISATION OF TRANSCONTAINERS AND TRANSCONTAINER WAGONS. SPECIFICATION FOR TRANSCONTAINERS OF CATEGORY 30/8-ISO 1B. STANDARD DESIGNS FOR NORMAL CLOSED CONTAINERS**

The subject of the report-the specification-is limited, as far as statements are given, to the study and construction of ISO-transcontainer prototypes of the Railway Administrations and their subsidiaries. The technical requirements and the testing and acceptance conditions and also some general requirements given in the specification exceed the conditions laid down in the existing international prescriptions (ISO recommendations, UIC Leaflets).

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B112/RP 6/E, Oct. 1971, 25 pp, 1 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 053208

**ELASTIC SYSTEMS FOR TRACTION AND SHOCK GEAR (SIDE BUFFERS AND CENTRE BUFFERS). ACCEPTANCE TESTS FOR THE ELASTIC SYSTEM OF THE "RING SPRING" TYPE B-412B FOR THE AUTOMATIC COUPLER**

The report deals with the acceptance tests with the elastic system ring spring type B 412 B and supplements report B 36/RP 14. All tests provided for in leaflet "Elastic systems-wagons" were carried out and successfully concluded. ORE Specialists Committee B 36 recommends acceptance of the elastic system ring spring type B 412 B.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B36/RP 16/E, Apr. 1976, 31 pp, 22 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 090415

**THE ELECTRIC RAILWAY PRESIDENT'S CONFERENCE COMMITTEE STREETCAR RESEARCH AND DEVELOPMENT PROGRAM: FIVE TECHNICAL BULLETINS, 1931-1933**

The street railway industry experienced a period of economic difficulty in the late 1920's as costs for new equipment and operating costs rapidly escalated, and automobile ownership increased dramatically. Industry leaders agreed on a unique industry research and development program to develop a totally different, technologically advanced street railway car that would compete in performance characteristics with the automobile, be less expensive to purchase, and that would increase transit ridership. The research program was financed by street railway companies and commercial firms in the transit supply business. They pioneered use of rubber suspension systems, unitized all-welded steel body construction, and advanced illumination.

Hirschfeld, CF

Electric Railway President's Conference Committee, Urban Mass Transportation Administration Spec Rpt. Bulletin 1, Sept. 1931, 143 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS Repr PC, Microfiche

PB0239996/2ST, DOTL NTIS

03 093772

**OVERHEATED JOURNAL BEARING DERAILMENT PREVENTION SYSTEM**

An anti-derailment system is disclosed in the patent application to prevent train derailment due to axle failure resulting from journal bearing overheating. The system includes a thermal sensor to continuously monitor the temperature of the bearing and to activate the brake system when the temperature exceeds a predetermined level. A thermally-responsive element located in the journal bearing adapter physically deforms to activate a power source. The resulting signal initiates an electro-explosive brake line venting mechanism, puncturing and venting the brake line to stop the train. Several configurations of the thermal sensor and the power source are possible.

Government-owned invention available for licensing. Copy of application available NTIS.

Armstrong, JH Kluge, FC

Department of the Navy Patent App PAT-APPL-495 478, Filed 7 Au, 17 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS Repr. PC, Microfiche

AD-D001260/9ST, DOTL NTIS

03 130213

**ROLLER BEARING COMPONENT FLAW DETECTION [Defektoskopiia detalei rolikovykh podshipnikov]**

During the operation of cars and locomotives with roller bearings, oscillations in the bearing components produce slight fatigue flaws which are invisible to the human eye. These can lead to bearing failures on the road with consequent journal failures. During maintenance of these bearings in shops, inspections of components may reveal only obvious defects. For detection of fatigue flaws in the early stages of development, a reliable technology of flaw detectors is indispensable. This booklet describes the fundamental principles of magnetic flaw detection for appraisal of roller bearing components during their repair. Included is a description of basic equipment in the shops for insuring highly reliable inspection. The brochure is intended for shop and maintenance workers concerned with flaw detection. Chapters include statement of the task; basic information about principles of flaw detectors; flaw detection equipment for freight car wheelsets and inner races of the roller bearings; disassembly of roller bearing components for inspection during overhaul; and magnetic particle flaw detectors. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Berezhnoi, OD Gubanov, AM Khрупkin

All-Union Labor Red Banner Railway Research Inst 1975, 24 pp, 13 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

**03 130217**  
**LOCOMOTIVE AND CAR PART FLAW DETECTION**  
**[Defektoskopiia detalei lokomotivov i vagonov]**

This publication presents the fundamental principles of ultrasonic, magnetic, color and luminescent flaw detection; briefly describes the conditions for the inception and development of defects in the more important components of electric locomotives, diesel locomotives, electric trains, diesel trains, and freight and passenger cars. Also presented are means for detecting fissures and metallurgical flaws in axles, crankshafts, pistons, wheel rims, drive gears, traction motor components and other rolling stock components. The book also covers the method of determining undesirable structures in metal axles, the fundamental data on ultrasonic and magnetic apparatus and indications on which should be used. The layout and operation of mechanized installations for inspection of axles is reviewed. This book is intended for workers in the facilities that maintain and build cars and locomotives who are involved with flaw detection of rolling stock components. The chapters are: (1) Magnetic particle flaw detection; (2) Inductive magnetic flaw detection; (3) Inspection using residual magnetization; (4) Principles of ultrasonic flaw detection; (5) Impulsive ultrasonic flaw detection; (6) Ultrasonic flaw detection of axles; (7) Automatic inspection of car wheelsets; (8) Ultrasonic inspection of transmission gears; (9) Ultrasonic inspection of diesel crankshafts; (10) Ultrasonic and magnetic inspection of diesel engine pistons; (11) Ultrasonic inspection of locomotive wheelsets; (12) Ultrasonic inspection of diesel-electric locomotive components; (13) Color flaw detection method; (14) Luminescent inspection method; (15) Fundamental problems of safety technology. [Russian]

Abstract only is available in English, original untranslated as of November 1976. The corporate author of the book is unknown.

1974, 240 pp, 136 Fig., 6 Tab., 23 Ref.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

**03 130279**  
**ORGANIZATION OF TECHNICAL INSPECTION AND THROUGH REPAIR OF RAILWAY CARS AT CLASSIFICATION YARDS**  
**[Organizatsiia tekhnicheskogo osmotra i bezotsepochnogo remonta vagonov na cortirovochnykh stantsiakh]**

As the operational experience of leading classification yards has revealed, technical inspection of groups of cars in receiving yards is an effective means of accelerating their processing. With the introduction of multigroup inspection it is necessary in each case to establish independently of the number of reprocessed compositions the optimal number of groups of technical inspectors and the optimal time for placing railway cars in the yard. It would be expedient to organize, at stations not having dispatching yards, "throughput" repair on a specialized classification track, or on tracks for equipment maintenance. The concentration of repair in a single place allows the wider application of various means of mechanization and repair machinery. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Sotnikov, IB *Zheleznodorozhnyi Transport* No. 3, 1974, pp 33-36, 2 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmannaya ul. 4, Moscow B-174, USSR

**03 133090**  
**GENERAL VEHICLE TEST PLAN (GVTP) FOR URBAN RAIL TRANSIT CARS**

The General Vehicle Test Plan provides a system for general vehicle testing and for documenting and utilizing data and information in the testing of urban rail transit cars. Test procedures are defined for nine categories: (1) Performance; (2) Power Consumption; (3) Power System Interaction; (4) Adhesion; (5) Ride Roughness; (6) Passenger Compartment Noise; (7) Community Noise; (8) Simulated Revenue Service; (9) Structure Dynamics. The procedures can be adapted to any vehicle in the general class of urban rail vehicles. They are derived from testing on UMTA's Rail Transit Test

Track in Pueblo, Colorado. In addition, these procedures can be modified for use on other urban rail tracks as required. Specifications are included for instrumentation required to implement the tests. Data processing and analysis requirements are defined by specifying standard output formats for the parameters of interest.

Neat, GW Lotz, R Kasameyer, R Oren, R Brown, PF  
 Boeing Vertol Company, Urban Mass Transportation Administration  
 Final Rpt., 4, nIDO UMTA-MA-06-0025-75-1, Sept. 1975, 346 pp

Contract DOT-TSC-580

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-250575/8ST, DOTL NTIS

**03 133295**  
**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. NEW CAR ENGINEERING**

The project was designed to develop a revised and updated series of handbooks covering various aspects of the design, construction, and equipment of a modern rail rapid transit system. This document contains information on new car engineering.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PCS70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt., 0 UMTA-IT-09-0014-75-1, Mar. 1975, 269 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-25165/6ST, DOTL NTIS

**03 133430**  
**SOAC: STATE-OF-THE-ART CAR ENGINEERING TESTS AT DEPARTMENT OF TRANSPORTATION HIGH SPEED GROUND TEST CENTER. VOLUME VII. POST-REPAIR TESTS**

The document presents the test results for the State-of-the-Art Car Post-Repair Engineering Test Program conducted at the DOT High-Speed Ground Test Center, Pueblo, Colorado, from March 18th to 29th, 1974. The SOAC has been developed under UMTA's Urban Rapid Rail Vehicle and Systems Program to enhance the attractiveness of rapid rail transportation to the urban traveller. The test data continuity between the original HSGTC Engineering Tests and the Post-Repair Test was established. Test data of variations from the original data have not been significant in terms of overall vehicle performance. A description of test procedures, equipment and facilities was provided in the original six-volume report, UMTA-MA-06-0025-75-1 through -6. PB-244 746 is the complete six volume set; PB-244 747 through PB-244 752 are the NTIS document numbers for each volume, I through VI respectively.

See also PB-247 752.

Oren, R  
 Boeing Vertol Company, Urban Mass Transportation Administration, Transportation Systems Center, (UMTA-MA-06-0025) Final Rpt., , nDOT UMTA-MA-06-0025-75-7, Nov. 1975, 206 pp

Contract DOT-TSC-580

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-252337/1ST, DOTL NTIS

**03 136407**  
**OVERVIEW OF CURRENT EFFORTS TO DETECT AND PREVENT STEEL WHEEL FAILURES**

Review of the nature of railroad wheels, including their more detrimental defects and conditions, and several of the nondestructive detection and evaluation techniques currently being considered for use in their assessment are presented, and data in tabular and graphical form are appended.

Presented at the 22 nd Meeting of Mech Failures Prev Group, Anaheim, Calif., Apr. 23-25, 1975.

National Bureau of Standards Spec. Publ No. 436, 1975, pp 261-288

## ACKNOWLEDGMENT: EI

ORDER FROM: National Bureau of Standards 14th Between E Street and Constitution Avenue, NW, Washington, D.C., 20234

## 03 137318

**AN ASSESSMENT OF THE CRASHWORTHINESS OF EXISTING URBAN RAIL VEHICLES. VOLUME III: TRAIN-COLLISION MODEL, USERS MANUAL**

The crashworthiness of existing urban rail vehicles (passenger cars) and the feasibility of improvements in this area were investigated. Both rail-car structural configurations and impact absorption devices were studied. This final report issued under the crashworthiness effort covers: (1) The development of analytical tools to predict passenger threat-environment during collision; (2) criteria for predicting passenger injury due to train collisions; (3) an application of injury criteria and analytic models to predict passenger injuries resulting from collisions of trains that represent existing construction types; (4) a preliminary investigation of applying impact absorption devices to transit vehicles; (5) a design study of car structural configurations for improved impact energy management; (6) a review of engineering standards for Urban Rail Car Crashworthiness. The report consists of three volumes.

See also PB-249143.

Segal, DJ

Calspan Corporation, Urban Mass Transportation Administration, Transportation Systems Center Final Rpt. DOT-TSC-UMTA-7521III, Nov. 1975, 66 pp

Contract DOT-TSC-681

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254695/0ST, DOTL NTIS

## 03 137320

**URBAN RAPID RAIL VEHICLE AND SYSTEMS PROGRAM**

The report reviews the fourth year's efforts of the Urban Mass Transportation Administration's Urban Rapid Rail Vehicle and Systems Program. The objective of the Program is to enhance the attractiveness of rail rapid transit to the urban traveler by providing him with transit vehicles that are as comfortable, reliable, safe and economical as possible. Accomplishments for the year included the following: Completion of the five-city test and evaluation of the SOAC cars; progress from the preliminary design phase to delivery of initial test hardware; completion of the integration of a self-synchronous propulsion system, a monomotor truck, and a synchronous brake into the SOAC cars; and preparation of subsystem specifications.

See also PB-245310.

Boeing Vertol Company, Urban Mass Transportation Administration, (UMTA-IT-06-0026) Ann. Rpt. D174-10038-1, UMTA-IT-06-0026-75-1, July 1975, 120 pp

Contract DOT-UT-10007

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254727/1ST, DOTL NTIS

## 03 137327

**SOAC. STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM. VOLUME 2. REPAIR, RE-TEST AND OPERATIONAL EVALUATION**

The two-volume report documented the design, fabrication and test of two new State-of-the-Art Cars (SOAC) whose objective was to demonstrate the best available (1971-72) rail rapid transit vehicle technology. The SOAC features a DC-DC chopper in the propulsion system, separately excited DC traction motors, all-steel construction (with molded fiberglass ends), and vandal-resistant and fire-retardant materials in the interior. This volume, Volume 2, of a two-volume report covers the repair of the damage sustained by the No. 2 car in an accident at the Transportation Test Center (TTC) in August 1973, the post-repair testing at the TTC, and the operational evaluation of the SOAC in revenue service in New York, Boston, Cleveland, Chicago and Philadelphia.

See also report dated April 74, PB-235703.

Dunton, WH

Boeing Vertol Company, Urban Mass Transportation Administration Final Rpt. D174-10031-2, UMTA-IT-06-0026-75-2, Sept. 1975, 249 pp

Contract DOT-UT-10007

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254770/1ST, DOTL NTIS

## 03 137335

**STRUCTURAL ANALYSIS AND DESIGN FOR ENERGY ABSORPTION IN IMPACT**

A general assessment of the nature of the dynamic problem of analyzing the collision of a vehicle is first given. A vehicle commonly comprises an open structure of beams and thin shells of ductile metal and the kinetic energy to be absorbed as energy of deformation is usually sufficient to cause plastic flow. This is generally localized on hinges and is associated with appreciable elastic deformation. Thus elastic-plastic theory is needed including geometrical and material non-linearities. Integration through the history of the motion is needed for solution. Theorems are given which provide approximations to the maximum plastic deformation and the duration of plastic flow without determining the whole solution. Application of these to simple models is presented. The theorems are also applied to determine the stiffness of a structural element so that it will transmit impulse to the rest of the structure without itself deforming appreciably, a so-called stiff interface. The ability of porous metal to absorb energy of deformation is also analyzed by solving the microscopic problem of collapse of the cavities. The overall macroscopic deformation laws can then be determined. Tests of the behavior of porous metal in impact are presented and related to quasistatic measurements of its deformation properties. Conclusions from these studies and recommendations for new work are given.

Lee, EH Mallett, RL

Stanford University, Department of Transportation Final Rpt. SUDAM-75-15, DOT/TST-76/44, Dec. 1975, 215 pp

Contract DOT-OS-30091

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254801/4ST, DOTL NTIS

## 03 137370

**A PROCEDURE FOR OPTIMIZING RAPID TRANSIT CAR DESIGN**

The report provides a methodology for creating an initial rough design of a rail rapid transit car, or for evaluating an existing design. It is based on optimizing the design features by minimizing the sum of the annual costs of purchasing, power consumption, maintenance, and on-board operating labor for a fleet of such vehicles. Linear programming is used to arrive at a solution based on the interaction of several hundred equations which describe the complex inter-relationships amongst the elements of car design, dimensions, and performance, and the various components and sub-assemblies which comprise the vehicle, and the associated costs.

Huss, MF

Polytechnic Institute of New York, Urban Mass Transportation Administration, (UMTA-NY-11-0009) Proj. Rpt. UMTA-NY-11-0009-75-3, May 1975, 248 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-2555048/1ST, DOTL NTIS

## 03 138075

**SUPERVISION OF HEATING OF AXLE-BOXES DURING HIGH SPEED TESTS [Die Ueberwachung der Radsatzlager-Erwaermung bei den Schnellfahrversuchen]**

No Abstract. [German]

Hartig, H *Eisenbahntechnische Rundschau* Vol. 24 N No. 2, Dec. 1975, pp 473-374, 1 Fig., 2 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

03 138361

**QUALITY OF AMTRAK RAIL PASSENGER SERVICE STILL HAMPERED BY INADEQUATE MAINTENANCE OF EQUIPMENT**

After 4 1/2 years of effort, U.S. rail passengers cannot consistently expect on-time service in clean and comfortable cars. If the public is to be provided with acceptable service, Amtrak must take more aggressive action to minimize its longstanding and well-publicized problems. Many of these relate to the repair and maintenance of passenger cars, locomotive and other equipment necessary to keep trains operating. Amtrak's program to improve maintenance has been costly, ineffective and slow. The General Accounting Office is making recommendations to help correct the deficiencies.

General Accounting Office RED-76-113, June 1976, 47 pp, 2 App.

ORDER FROM: General Accounting Office 441 G Street, NW, Washington, D.C., 20008

03 139448

**FLEXIBLE BODY RAILROAD FREIGHT CAR. TECHNICAL DOCUMENTATION**

The objective of this study is to develop a mathematical model of the freight car with a flexible car body, using numerical analysis techniques. Such an analysis will be helpful to understand the dynamic behavior of a freight car better. The model is considered to be consisting of a car body separated into two rigid masses, two bolster, two wheelsets with the side frames. These are joined together by non-linear springs and dampers (Fig. 1). The model will be described in detail in Chapter II. Twenty two degrees of freedom are assumed. Since the car body is assumed to be flexible, it is divided into two, the front and the rear mass. With two constraint equations, twenty coupled simultaneous non-linear differential equations are developed as the equations of motions of this complicated system. The formulating these equations. The equations are uncoupled by tools in the study of the rigid body dynamics, is used in formulating these equations. The equations are uncoupled by the Gaussian elimination method and integrated by the efficient Runge-Kutta scheme, both of which are standard computer programs. Effects of the system parameters, such as the height of the center-of-gravity of the car body, the truck center distance, suspension and damping can be analyzed with the program.

Tse, YH Martin, GC

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Development Agency No. R-199, No Date, 122 pp, Figs., Tabs., 8 Ref.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

03 139462

**A NEW TEMPERATURE MONITORING SYSTEM FOR AXLE BEARINGS ON HIGH-SPEED PASSENGER TRAINS [Neuartiges Temperatur-Uberwachungssystem fuer Radsatzlager bei schnellaufenden Reiszugen]**

Neither manual inspection nor the fixed overheating detectors fitted by the DB are adequate to monitor the temperature of bearings on high-speed passenger trains. In collaboration with bearing manufacturers and the DB, the firm of Jaeger has designed a continuous temperature monitoring system for bearings on locomotives and coaches. The article gives a brief description of this system. [German]

*Glaser's Annalen ZEV* Vol. 100 No. 2/3, Feb. 1976, pp 118-120, 3 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

03 139469

**THE TILTING BODY TECHNIQUE FOR RAILWAY VEHICLES, TO INCREASE SPEED WHEN NEGOTIATING CURVES [La tecnica de la inclinacion de las cajas de los vehiculos ferroviarios a su paso por las curvas]**

The article describes the RENFE's solution of tilting bodies for railway vehicles, evolved in collaboration with the FS, and the methodology adopted for systematic analysis of the time gained by using this type of train. [Spanish]

Sanchez Gonzalez, JL Theureau, LE

Asociacion de Investigacion del Transporte No. 8, Feb. 1976, pp 41-54, 6 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: Asociacion de Investigacion del Transporte Madrid, Spain

03 139481

**THE WHEELSET AXLE, CALCULATION OF ITS FATIGUE STRENGTH? [Dier Radsatzwelle-Berechnung auf Dauerfestigkeit?]**

In general, resistance to repeated stresses is taken into account in the design of axle journals. But the stresses on the axle are constantly being modified during running; the forces are therefore not constant, as assumed in the calculations, but a succession of efforts. It is absolutely impossible to know whereabouts in this success the points used for calculation occurs, both with regard to the intensity of the effort and the point in the stress cycle to which it corresponds. The authors draw some conclusions based on present progress in research into fatigue strength and results of measurements of the forces exerted between wheel and rail. [German]

Brinkmann, P Freytag, R *Eisenbahntechnische Rundschau* Vol. 25 No. 3, Mar. 1976, pp 141-146, 21 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

03 139532

**THE NEW FAMILY OF FIAT BOGIES FOR PASSENGER COACHES [La nuova famiglia di carrelli Fiat per vercoli passeggeri]**

Description and comparison of the different alternative versions of a type of bogie developed by FIAT using computerised calculation and test methods to met the new comfort requirements. [Italian]

Santanera, O *Ingegneria Ferroviaria* No. 2, Feb. 1976, pp 3-14, 13 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

03 139949

**JOURNAL ROLLER BEARINGS: A CONTRIBUTION TO THE TECHNICAL DEVELOPMENT**

Journal roller bearings must optimally fit into the total integrity of every rail-vehicle. Therefore, no isolated approach is possible. They must be so dimensioned, as to guarantee a high degree of operational safety. Maintenance costs must be aside from acquisition costs, an integral part of any economic consideration. Long years of practical experience allowed to rate the qualities and characteristics as well as the useful life of different journal roller bearing types. [German]

Volkening, W *Glaser's Annalen ZEV* Vol. 100 No. 4, Apr. 1976, pp 134-144

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

03 141115

**RELIABILITY OF RAILROAD ROLLER BEARINGS**

Bearing defect data from 8000 railroad roller bearings were analyzed to determine their defect modes and defect rate distributions. Cone bore growth, brinelling, and fatigue were identified as the predominant defect modes as bearings age at least through age 12 years. The observed data were fitted with a Weibull failure distribution and estimates were made of the Weibull parameters. A comparison was also made between the incidence of fatigue spalls and estimates of fatigue life based on the AFBMA method. The results of the study show that, after only two years of service, ten percent of all railroad roller bearings exhibit a defect of one type or another for which at least one component would be condemned if it were in a rework shop. The present AFBMA method of calculating fatigue spalling, modified to account for lubricant film thickness effects, correlates reasonably well with the observed incidence of spalling (10 percent fatigue life of about 11 years). The problem lies in the fact that the AFBMA calculation procedure ignores the other competing defect modes which contribute far more to the overall defect

rate than does spalling. One of these, cone bore growth, is a major contributor to the overall defect rate and deserves special attention. The relationship between "defect rate" and "failure rate" is not direct, and an examination of "condemning limit" definitions relative to the progression of bearing failure in service is needed.

Paper presented to American Association of Mechanical Engineers Meeting, May 24-26, 1976.

Krauter, AI (Shaker Research Corporation); McGrew, JM, Jr Moyer, GJ  
American Society of Mechanical Engineers Conf Paper Paper N. 76-LubS-18, May 1976, 7 pp, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

03 141117

**WEAR-RESISTANT FILLER KEEPS RAIL CARS ROLLING**

The Chesapeake and Ohio Railway Co. uses a new patented process to reclaim bolster bowls on freight cars. The new process involves the use of a wear-resistant alloy filler metal. The process cuts costs by 60% compared with the old method, builds bolster bowls that last three to four times longer than bowls repaired by the old method, requires fewer inspections, and avoids the need to grind or machine the bolster bowl to finished inside-diameter specifications.

*Welding Design and Fabrication* Vol. 49 No. 4, Apr. 1976, pp 92-93

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

03 141431

**STUDY OF "F" COUPLERS CAST BEFORE MARCH 1970**

Three hundred and thirty-five "F" couplers removed from service during heavy repair of TTX cars were examined and measured. Selected couplers cast before March of 1970 and which had cracks, were tested at 0üF and room temperature to determine the strength of the butt in pull. Metallurgical analysis of the selected couplers were made. Conclusions relating miles of service to expected strength are published.

A field survey report issued by the Railroad Coupler Safety Research and Test Project, a Railway Progress Institute and Association of American Railroads cooperative program. See Report No. 8 for metallurgical study of these same couplers, RRIS 03 141432.

Morella, NA  
Association of American Railroads Technical Center Tech. Rpt. N. 7 (AAR N. R241), Nov. 1975, 30 pp, 18 Fig.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

03 141432

**FRACTURE ANALYSIS AND MATERIAL EVALUATION OF BUTTS FROM "F" COUPLERS CAST BEFORE MARCH 1970**

The areas of fracture surfaces projected on the load-bearing planes of a group of coupler butts were measured. Division into two sub-groups of high and low mileage revealed no correlation of fracture area to mileage, but division into subgroups according to microstructure and casting defect type did give substantial increases of fatigue fracture area for components with large defects and increases of sudden rupture area for components with mixed microstructures. Standard tensile and chemical test results are given for future correlation with over-all component tensile and impact tests.

AAR Test Division Project No. M012, Railroad Coupler Safety Research and Test Project. Metallurgical analyses complementing physical tests in Report No. 7, RRIS 03 141431.

Fleming, LD  
Association of American Railroads Technical Center Tech. Rpt. N. 8 (AAR N. R242), Oct. 1975, 138 pp, 113 Fig., 2 App.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

03 141443

**TEST BENCH FOR WHEELSET AXLEBOXES OF HIGH-SPEED RAIL VEHICLES [Pruefstand fuer Radsatzlager von Hochgeschwindigkeits-Schienenfahrzeugen]**  
No Abstract. [German]

Burnaby, LE *Kugellager-Zeitschrift* Vol. 50 No. 186, 1976, pp 1-7, 8 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Kugellager-Zeitschrift Schweinfurt, West Germany

03 141448

**FATIGUE STRENGTH AND STATIC STRESS OF AUTOMATIC COUPLERS [Ustalostnaja i staticeskaja procnost' avtosceplki]**  
The article contains: the results of an experimental study on fatigue strength and static stress of automatic couplers, the criteria for assessing fatigue strength during comparative tests, and recommendations for improving the reliability of the automatic coupler. [Russian]

Kolomijcenko, VV Otvecalin, VI *Zheleznodorozhnyi Transport* No. 5, 1976, pp 64-67, 3 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmannaya ul. 4, Moscow B-174, USSR

03 141454

**THE STRESS/TIME FUNCTION OF FREIGHT WAGON BOGIE FRAMES, AND ITS IMPORTANCE FOR CONCLUSIVE TESTS ON VIBRATION RESISTANCE [Die Beanspruchungs-Zeit-Funktion an Guterwagendrehgestellrahmen und ihre Bedeutung fuer den versuch aussage fahigen Schwingfestigkeitsversuch]**  
No Abstract. [German]

Umbach, R Schenk, H *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 1-2, Jan. 1976, pp 14-20, 2 Fig., 1 Tab., 11 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge Munich, West Germany

03 141456

**THEORETICAL STUDY AND TESTING WITH A MODEL OF COMPOSITE COMPONENTS FOR RAILWAY VEHICLE CONSTRUCTION [Theoretische Untersuchungen und Modellversuche an Kompositbauteilen fuer den Schienenfahrzeugbau]**  
The aim is to establish universally applicable formulae for the deformation and strain characteristics of a composite member under a bending load. The author proposes a method for calculating probable deflection and stresses. The results of tests on models prove the utility of these formulae. [German]

Polzin, G *Leichtbau der Verkehrsfahrzeuge* No. 1-2, Jan. 1976, pp 9-14, 8 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge Munich, West Germany

03 141457

**PROBLEMS OF STRESS DISTRIBUTION IN LIGHT RAIL VEHICLE ENGINEERING SHOWN BY MEANS OF CONSTRUCTIONAL EXAMPLES AND TESTS WITH PASSENGER AND FREIGHT VEHICLES [Krafteinleitungs- und Fortleitungsprobleme im Schienenfahrzeugleichtbau dargestellt anhand von Konstruktionsbeispielen und Erfahrungen im Personen- und Guterfahrzeugbau]**  
No Abstract. [German]

Salzgitter, S *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 1-2, Jan. 1976, pp 4-9, 4 Fig., 4 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge Munich, West Germany

03 141463

**THE CASE FOR STRENGTHENING THE FLEXURAL RIDIGITY OF THE BODIES OF HIGH SPEED VEHICLES [O povysenii izgibnoj zestkosti kuzovov vysokoskorostnigh passazirskih vagonov]**  
No Abstract. [Russian]

Versinskij, SV Juhnevskij, AA *Vestnik Vniit* No. 3, 1976, pp 16-20, 1 Tab., 5 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Vestnik Vniit 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

03 141569

**ACT-1 TURNS IDEAS INTO HARDWARE**

Flywheel energy storage, lightweight sandwich body panels and aircraft air-conditioning are some of the innovations on UMTA's two-car Advanced Concept Train (ACT), due for delivery by Garrett. Like the State-of-the-Art (SOAC) cars produced in 1973, Act-1 is an attempt to push transit car technology forward after decades of neglect. UMTA's two objectives are to promote vehicle and component standardization in the USA so as to cut unit costs, but also to make the best use of novel techniques once they are proved to be thoroughly reliable. Beyond the test program, ACT-1 may serve as the engineering basis for a production car tailored to suit specific needs, but meeting as far as is practicable UMTA's goal of standardization in the interests of economy and reliability.

Silien, JS (Urban Mass Transportation Administration) *Railway Gazette International* Vol. 132 No. 9, Sept. 1976, pp 329-333, 3 Fig.

ORDER FROM: ESL

DOTL JC

03 141570

**HOW THE WEIGHT OF PASSENGER CARS HAS BEEN TRIMMED**

In two decades, Japanese carbuilders have reduced the linear mass of carbody shells by improving construction techniques and using light alloys. Similar savings might have been made in trucks and electrical equipment had weight reduction measures not been offset by more elaborate suspensions and demands for higher power ratings. It is in these two areas that the search for further savings must be made, as large extrusions have brought economic use of material in body construction close to the theoretical limit.

Kato, M (Japanese National Railways) *Railway Gazette International* Vol. 132 No. 9, Sept. 1976, pp 334-38, 2 Fig., 2 Tab., 2 Phot.

ORDER FROM: ESL

DOTL JC

03 141643

**BOGIE STRUCTURE DESIGN MUST BE RIGHT**

British Rail's Railway Technical Centre at Derby is well known to be among the largest and best equipped complex of its kind, housing the R&D Division and Rolling Stock Design Department. Design and testing facilities developed or adapted there for railway engineering are now applied to all new vehicle designs. In describing the development of the Class 87 locomotive bogie frame, the author illustrates the exacting design strategy applied to a structure of complex shape and working in exceptionally arduous conditions.

Lowe, B *Engineering* Vol. 216 No. 7, July 1976, pp 480-483, 5 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

03 141650

**STUDY ON THE RESIDUAL STRESSES IN RAILROAD SOLID WHEELS AND THEIR EFFECT ON WHEEL FRACTURE**

Residual stresses in two types of wheel were measured by the X-ray method and by the method of taking samples from the rim surface, while the thermal stresses produced in service were simulated by test bench braking and calculated by the finite element method. The brakes were applied until cracks appeared and their spread was studied according to the laws of fracture mechanics. The authors draw conclusions on the conditions in which superficial cracks can lead to wheel fracture.

Nishimura, S Tokimasa, K *JSME Bulletin* Vol. 19 No. 131, May 1976, pp 459-468, 13 Fig., 9 Tab., 14 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

03 142248

**FRETTING CORROSION AND FATIGUE STRENGTH OF WHEEL-SEAT OF CAR AXLE**

This paper presents the investigations of fretting corrosion and fatigue of car axles which were obtained by using the full-scale wheel-and-axle fatigue testing machine at the Railway Technical Research Institute. Test results indicate the effect of shape and heat treatment on fatigue, both very important from the standpoint of wheelset design and maintenance. Four designs of wheel seat were tested along with three methods of heat treatment--normalizing, quench-tempering and induction hardening.

Tanaka, S Hatsuno, K Mohr, B Yaguchi, S  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, 5 pp, 8 Fig., 2 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute

ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

03 142250

**THE EFFECTS OF HARDENING DEPTH AND TEMPERING TEMPERATURE ON RESIDUAL STRESS DISTRIBUTION IN MEDIUM FREQUENCY INDUCTION HARDENED RAILWAY CAR-AXLES**

To develop optimum induction hardening conditions for improvement of fatigue strength of axles, the effect of hardening depth and tempering temperature on residual stress distribution in specimen steel axles was investigated. Residual compressive stress in the surface and residual tensile stress in the center were produced by medium frequency hardening. Medium frequency induction hardening and 200 C tempering may be optimum for axles from the viewpoint of residual stress distribution and toughness of the hardened case.

Sato, H Iijima, K Isomura, R  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 25-29, 9 Fig., 3 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute

ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

03 142525

**LONG-TERM BEHAVIOR OF HARD POLYURETHANE FOAM AND COMPOSITE ELEMENTS UNDER TYPICAL RAILWAY VEHICLE CONDITIONS [Langzeitverhalten von PUR-Hartschaum und Verbundelementen unter Schienenfahrzeugtypischen Bedingungen]**

The assessment of long-term static and dynamic loads and effects of weathering in vehicles built on the "sandwich" principle on a hard polyurethane foam support is different from that of vehicles with the traditional metal underframe. It is therefore necessary to find out the effect of these influences on the foam and the composite elements for a period of 2.10 to the fifth power hours (approx. 24 years). The authors describe the first results of the tests completed. [German]

Thiele, F *DET Eisenbahntechnik* Vol. 24 No. 7, July 1976, pp 319-322, 2 Fig., 9 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: VEB Verlag Technik Oranienburgerstrasse 13-14, 102 Berlin, East Germany

03 142531

**MANUFACTURE OF WELDED ALUMINUM BODIES FOR SUBWAY TWO-WAY CAB-DRIVEN CARS [Herstellung von U-Bahn-Doppeltriebwagen in Aluminium-Schweisskonstruktion]**

The article describes the manufacture of welded aluminum alloy bodies for the East Berlin subway system, with emphasis placed on production requirements, welder training, and welding processes and equipment used. [German]

Kroschewsky, HJ (Komb Lokomotivbau); Oldenburg, H *Schweisstechnik* Vol. 26 No. 4, Apr. 1976, pp 147-150, 1 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

03 142592

**NEW MULTIPLE UNIT TRAINSET TYPE 472/473 FOR THE SUBURBAN SERVICE IN HAMBURG**

These new multiple unit vehicles will replace an obsolete fleet. A trainset will consist of two traction cab car type 472 for 2nd class and one middle car type 473 for 1st class passengers. D.C. power at 1200 V is picked up from the 3rd rail by means of 8 collectors. Maximum speed is 100 km/h, maximum acceleration 1.75 m/sq s, deceleration 0.67 m/sq s. Total weight with maximum passenger load of 698 people is 166t. [German]

Rappenglueck, W *Elektrische Bahnen* Mar. 1975, pp 57-64, 8 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: ESL

DOTL JC

03 142598

**THE TYPE E151 ELECTRIC LOCOMOTIVE**

The main design details of the electrical and mechanical equipment are given and the changes introduced on items used on earlier locomotives are discussed. Great attention has been paid to the comfort of the driver. [German]

Guthlein, H *Elektrische Bahnen* Mar. 1973, pp 50-61, 3 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: ESL

DOTL JC

03 142599

**ELECTRIC MULTIPLE UNIT EXPRESS TRAINSET TYPE ET403 OF THE DB**

Technical specifications are presented as formulated at the time of ordering of the Intercity Multiple unit cars for German Federal Railway. Detailed description of the ET403 introduces the new technology. [German]

See also RRIS, 052122, RRIS Bulletin 7402.

Rappenglueck, W *Elektrische Bahnen* May 1973, pp 89-108, 2 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: ESL

DOTL JC

03 144066

**DETERMINATION OF THE OPTIMAL APPROACH TO RAIL RAPID TRANSIT CAR STANDARDIZATION**

This report documents the findings of Phase I of a two-part program on standardization of rail rapid transit cars. The purpose of Phase I was to determine the optimal form of standardization which would: stabilize the prices of new rail rapid transit cars; reduce operating and maintenance costs; improve equipment reliability and maintainability. APTA, the American Public Transit Association, and RPI, the Railway Progress Institute, established technical boards which provided transit industry technical analysis and review of the work plans, approaches, and findings of the technical contractor. This first phase final report documents the analysis leading to a determination that rail rapid transit car standardization is feasible and should be implemented under a phased program to develop a qualified products list and products qualification procedure, a car prototype certification procedure, and a family of car performance specifications.

Work sponsored by UMTA, DOT.

Morris, R McGinnis, N deRegt, M Reinhardt, W International Research & Technology Corporation, (ITR-440-R) Final Rpt. UMTA-IT-06-0131-761, Aug. 1976, 131 pp

Contract DOT-UT-60056

ACKNOWLEDGMENT: UMTA

ORDER FROM: NTIS

PB-259363, DOTL NTIS

03 144078

**THE NEW BLUE OX--A WOOD-SHIPPER'S DREAM**

A high-cube, open-top automatic unloading car, designated Blue Ox, has been developed to haul woodchips and logs for pulping. The prototype is the result of a three-year R&D program initiated by Pullman-Standard and International Paper Co. The demand for such a car is seen as substantial if paper-industry production projects are accurate.

Welty, G *Railway Age* Vol. 177 No. 20, Oct. 1976, pp 20-22

ORDER FROM: ESL

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03 144079

**\$900 MILLION FOR ENCLOSED AND SHIELDED AUTO RACK CARS**

An expenditure of \$900 million for 14,000 new multilevel cars for new automobile transport and for 8,000 conversions of existing open cars is expected by 1983. The main reason for this new family of auto transporters is the damage done to unenclosed automobiles and the loss of equipment from them caused by vandalism and pilferage. Railroads are moving aggressively to retain and expand their share of the auto hauling business which has expanded from 10 percent of all production in 1960 to 53.6 percent in 1975.

*Railway Age* Vol. 177 No. 20, Oct. 1976, pp 40-42

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03 145141

**PROGRESS IN RAILWAY MECHANICAL ENGINEERING (1975-1976 REPORT OF SURVEY COMMITTEE) CARS AND EQUIPMENT**

This survey of the annual ASME report covers some of the major developments in freight and passenger equipment made public in the last calendar year. It also covers developments worldwide as well as domestic. In the freight area, the main developments aimed at the transport of bulk commodities and unit trains with some thought being given to increased speeds. The passenger developments are continuing in LRVs, Rapid transit, and commuter transport.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Manos, WP

American Society of Mechanical Engineers Conf Paper 76-WA/RT-12, Dec. 1976, 9 pp, 36 Fig.

ACKNOWLEDGMENT: ASME

ORDER FROM: ESL

DOTL RP

03 145142

**THERMAL PATTERNS IN 36 INCH FREIGHT CAR WHEELS DURING SERVICE TESTS**

Service tests were conducted on the Atchison, Topeka and Santa Fe Railway Co. track at various speeds with an instrumented brake beam to determine the normal (perpendicular) and retarding (circumferential) brake shoe forces applied to a wheel set. The specially designed brake beam and load measuring transducers were installed in a truck under a 100-ton gondola used as the test car. The wheel set installed in this truck consisted of two different wheel designs mounted on the same axle. These wheels were instrumented with thermocouples embedded in the tread and plate areas to determine the temperature generated under controlled service brake application. Different types of brake shoes instrumented with thermocouples were also used to determine wheel-brake shoe heat flow characteristics. The retarding force applied to the wheel tread surface by the brake shoe was controlled by an air source independent of the train line source.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Novak, GE (Del Engineering, Incorporated); Dahlman, GE (Atchison, Topeka and Santa Fe Railway); Eck, BJ Kucera, W (Griffin Wheel Company)

American Society of Mechanical Engineers Conf Paper 76-WA/RT-11, Dec. 1976, 8 pp, 16 Fig., 16 Ref.

ACKNOWLEDGMENT: ASME

ORDER FROM: ESL

DOTL RP



03 145144

**A METHOD OF FIELD TESTING AND DATA REDUCTION TO DETERMINE FORCES ACTING ON A FREIGHT CAR IN REVENUE SERVICE**

This paper describes a method of conducting road service tests using an instrumented freight car capable of traveling anonymously and unattended in revenue trains. The data collected in the tests described were coupler longitudinal and vertical forces. A magnetic tape recorder located inside the car recorded the data digitally. The recorder was actuated only when the force levels were above a preset level, thus allowing very long-term testing. An elapsed time meter recording on one channel of the tape allowed correlated of the recorded data with the milepost location of the test car. The testing procedure and computer reduction of the field test data are described.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Morella, NA (Midland-Ross Corporation); Cook, RM (Association of American Railroads Technical Center)  
American Society of Mechanical Engineers Conf Paper 76/WA/RT-9, Dec. 1976, 9 pp, 11 Fig., 5 Ref., 1 App.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

03 145145

**ESTABLISHING WORKING PROCEDURES FOR THE SELECTION OF RAILROAD FREIGHT CAR TRUCKS**

Technical and economic research for evaluating railroad freight car truck operations was sponsored by the Federal Railroad Administration. The Truck Design Optimization Project (TDOP) was formed and undertaken by the Southern Pacific Transportation Company of San Francisco, Calif., to carry out the first phase of the program, which was coordinated with representatives in the railroad industry. The technical effort consisted of extensive field testing of conventional freight car trucks under various loadings, car types, track conditions, speeds, and a wide range of modifications. The economic effort consisted of developing and testing the methodology for determining the economic behavior of similar trucks under similar conditions. The steps taken in the development consisted of selecting the investment alternatives, establishing the investment evaluation procedures, identifying the cost data, developing the data collection procedures, and establishing the data analysis procedures (Truck Investment Evaluation Model) for optimizing economic selections among existing trucks and proposed truck improvements.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

April, D (April Associates); Byrne, R (Southern Pacific Transportation Company)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-8, Dec. 1976, 8 pp, 4 Fig., 7 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

03 145147

**PROGRESS IN RAILWAY MECHANICAL ENGINEERING, 1975-1976 REPORT OF SURVEY COMMITTEE: LOCOMOTIVES**

This report covers motive power designs that have been delivered, and developments undertaken in the survey period of September 1, 1975 to September 1, 1976. Data and photographs for six new diesel locomotives, six electric locomotives, and six train sets are presented. Electrification plans on a world-wide basis are also discussed.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Baker, PH Schulze, FW (General Electric Company)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-6, Dec. 1976, 12 pp, 19 Fig., 3 Tab., 7 Ref.

ACKNOWLEDGMENT: ASME  
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DOTL RP

03 145156

**FAMILY OF SNCF B-B ELECTRIC LOCOMOTIVES IS COMPLETE**

With the delivery by Francorail-MTE and Alstom of ac/dc and dc-only versions of the successful BB 15000 introduced in 1971 for 25 kV ac lines, the four-axle family of standard French electric locomotives is complete. Modular electric components within a common mechanical design keep down the cost of production and maintenance.

*Railway Gazette International* Vol. 132 No. 8, Aug. 1976, p 304, 2 Fig., 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: ESL

DOTL JC

03 145168

**EQUIPMENT ENFORCEMENT MANUAL**  
No Abstract.

Federal Railroad Administration, (TD 3.8:Eq5) 1976, 155 pp, Figs.

ACKNOWLEDGMENT: Government Research Abstracts  
ORDER FROM: FRA

GPO Item 701-F

03 145172

**CLRV-CANADIAN LIGHT RAIL VEHICLE**

This booklet looks at light rail transit in Canada. The new Canadian Light Rail Vehicle (CLRV) incorporates major design features emphasizing adaptability for light rapid transit operations. Other features provide for a more efficient and longer vehicle life, improvement in passenger comfort and convenience, and reduction in environmental noise.

Urban Transportation Development Corporation No date, 13 pp, 3 Fig., 8 Phot.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

03 145649

**CONFIGURATION AND TECHNICAL CHARACTERISTICS OF TYPICAL FOREIGN AND DOMESTIC RAILWAY LOCOMOTIVES**

Detailed technical information concerning the identification and classification of railway locomotives is presented by photographs and data tables of typical locomotives found throughout the world. A standard method of locomotive classification is described. Illustrations of equipment plans and associated narrative serve to establish the appearance and location of critical components. Start-up and operating controls located in the cab are identified. General operating notes give a brief description of the function of components and the overall means for providing motive power. (Author)

Distribution limitation now removed.

Smith, WT Zirkel, PR  
Technical Services Corporation, (RDT/E-1-W-562603-A-3) June 1969, 100 pp

Contract DAAD05-67-C-0646

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-858393/2ST, DOTL NTIS

03 147686

**LIGHT VEHICLE DESIGN PHILOSOPHY**

Shielded arc welding, greater knowledge about fatigue of welded joints, development of large extrusions and desire to conserve energy have resulted in greater interest in application of aluminum for rolling stock. History of the material's application and ways it is used in contemporary passenger equipment are discussed.

Zehnder, J (Swiss Aluminum Limited) *Railway Engineer* Vol. 1 No. 6, Nov. 1976, pp 46-48, 7 Fig.

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

03 147687

**VEHICLE DESIGN ACOUSTICS**

Acoustic aspects of railway vehicle design are complicated by lightweight construction. Noise transmission is greater and enforces design constraints much like those applied to highway vehicles and aircraft. It is concluded that more needs to be done about rail vehicle acoustic design with primary emphasis on acoustic transmission properties of the suspension components, the mounting of engines and auxiliary equipment, and the properties of body structure with respect to stressed skin construction and sound deadening treatments. Design techniques can now fix ways in which the external noise field and aerodynamics contribute to interior noise level.

Eade, PW Stanworth, CG *Railway Engineer* Vol. 1 No. 6, Nov. 1976, pp 34-40, 5 Fig., 2 Tab., 8 Ref.

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

03 147702

**LOCOMOTIVE CAB DESIGN DEVELOPMENT. VOLUME 1: ANALYSIS OF LOCOMOTIVE CAB ENVIRONMENT & DEVELOPMENT OF CAB DESIGN ALTERNATIVES**

This report presents an analysis of the line haul freight engineer's working and living environment, the resultant locomotive cab design and design alternatives. The analysis is based on a delineation of functional requirements found in current line haul operations together with those additional requirements which could arise during the next 10-15 years. The recommended design is the result of a detailed human factors engineering analysis of these requirements according to state-of-the-art criteria and system design practices. Substantial engineering analysis was devoted to the recommended design; this included disciplines of cost, occupant protection, component and subsystem reliability, and system safety analysis.

Research was sponsored by the DOT, FRA, Office of Research and Development, under contract to the Transportation Systems Center, Cambridge, Massachusetts.

Robinson, J Piccione, D Lamers, G

Boeing Vertol Company, (DOT-TSC-FRA-76-22-1) Intrm Rpt. FRA-/OR&D-76/275.1, Oct. 1976, 206 pp, Figs., Tabs., 3 App.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

PB-262976/AS, DOTL NTIS, DOTL RP

03 147703

**LOCOMOTIVE CAB DESIGN DEVELOPMENT. VOLUME 2: OPERATOR'S MANUAL**

Locomotive Cab 913 designed as a result of Contract DOT-TSC- 913 has been built as a hard mock-up. This Operator's Manual is to familiarize the user with the mock-up. Normal and emergency procedures and cab facilities are described.

Research sponsored by the DOT, FRA, Office of Research and Development, under contract to the Transportation Systems Center, Cambridge, Massachusetts.

Robinson, J Piccione, D

Boeing Vertol Company, (DOT-TSC-FRA-76-22-2) Intrm Rpt. FRA-/OR&D-76/275.2, Oct. 1976, 42 pp, 10 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS

03 147704

**LOCOMOTIVE CAB DESIGN DEVELOPMENT. VOLUME 3: DESIGN APPLICATION ANALYSIS**

In Volume II of this service of reports on Locomotive Cab Design Development, changes were recommended in the layout and equipment content of locomotive cabs. This report studies the impact of these changes on the interface of the cab with the rest of the locomotive, the required structure, the reliability, the development costs, and the cost of introduction to the operating locomotive fleet. In addition, this report assesses the uses of various techniques of mockup use during the development phases of the design.

Research sponsored by the DOT, FRA, Office of Research and Development, under contract to the Transportation Systems Center,

Cambridge, Massachusetts.

Robinson, J

Boeing Vertol Company, (DOT-TSC-FRA-76-22-3) Intrm Rpt. FRA-/OR&D-76/275.3, Oct. 1976, 82 pp, Figs., 8 Tab., 3 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS, DOTL RP

03 147706

**ANALYSIS OF ENVIRONMENTAL TRUCK COMPONENT LOAD AND BOLSTER FATIGUE TEST DATA**

Three series of U.S. railroad environmental service tests for freight car trucks acquired recorded data relevant to the test car(s) and truck(s) and to the track traversed. The methods of data processing and analysis are explained. Load spectra are developed for side frame and bolster side bearing vertical channels, and for "bounce" and "rock" cycles, with analysis and presentation of results sorted by speed ranges and by track or railroad locations. The reduced data evolved into curves of loading magnitudes plotted against occurrences per mile. Principles in the development of a truck bolster fatigue specification are discussed. Very preliminary results from mutual bolster lab test programs are presented.

See AAR Report R-182, Report on Freight Car Truck Road Service Tests Series A, B, & C, RRIS 03 147708. This report presents interim results of the RPI-AAR Railroad Truck Safety Research and Test Project.

Evans, RA Johnson, MR

Association of American Railroads Technical Center Res. Rpt. R-246, Sept. 1976, 114 pp, 65 Fig., 4 Tab., 5 Ref., 2 App.

Contract RPI-AAR-1972

ACKNOWLEDGMENT: Association of American Railroads Technical Center

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

03 147708

**FREIGHT CAR TRUCK ROAD SERVICE TESTS--SERIES A, B & C**

Review of several U.S. railroad environmental service tests for freight car truck information. Three series of road service tests develop instrumentation practices and program to obtain reliable, complete magnetic tape recorded information as to forces and/or strains on car truck components. "A" test primarily for development of instrumentation; also gaining information on 70 ton car trucks. "B" and "C" test series obtain variety of information on 100 ton hopper car truck in severe service. Recounts conditions and areas of test, analysis of data to be separate report.

See AAR Report R-246, Analysis of Environmental Truck Component Load and Bolster Fatigue Test Data, RRIS 03 147706. This report is part of the RPI-AAR Railroad Truck Safety Research and Test Project.

Evans, RA

Association of American Railroads Technical Center Res. Rpt. R-182, July 1975, 24 pp, 10 Fig., 3 Tab.

Contract RPI/AAR 1972

ACKNOWLEDGMENT: Association of American Railroads Technical Center

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

03 147711

**EVALUATION OF PROTOTYPE HEAD SHIELD FOR HAZARDOUS MATERIAL TANK CAR**

The structural integrity of a prototype tank car head shield for hazardous material railroad tank cars was evaluated under conditions of freight car coupling at moderate to high speeds. This is one of the most severe environments encountered in normal railroad service. Two versions of the shield were tested. They were installed on a DOT Spec. 112A340W tank car and instrumented to measure forces at the points of attachment between the shield and the car. Test data were obtained when the car was impacted into standing cars over a 3 to 9 mph speed range. The tests produced no visible damage to the shield or the structure connecting it to the tank car, but they demonstrated the presence of severe vibrations resulting from the car impact.

The likelihood of fatigue damage was indicated in the connecting structural members where the weight of the shield was supported. Modifications to the supporting structure are recommended before proceeding with additional impact tests and over-the-road tests.

Research was sponsored by the FRA, Office of Research and Development.

Johnson, MR  
IIT Research Institute, (DOT-TSC-FRA-76-8) Final Rpt. FRA/  
OR&D-75-96, Dec. 1976, 60 pp, 27 Fig., 1 Tab., 2 App.

Contract DOT-TSC-727

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

**03 147825**  
**THE ELECTRO-HYDRAULIC TILT SYSTEM FOR PASSENGER COACHES OF THE SWISS FEDERAL RAILWAYS (SBB)**

SBB has tried out a tilt system for passenger coaches in order to obtain a higher travelling speed round curves. The system was developed by SIG Schweizerische Industrie-Gesellschaft (hydraulic part) and Honeywell (electronics) in cooperation with SBB. The equipment is described, and a brief report is given on the trail runs. [German]

See also 02 146281.

Wipf, R *Glaser's Annalen ZEV* Vol. 100 No. 9, Sept. 1976, pp 286-91

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**03 147827**  
**WITH LOW SMOKE, TOXICITY, BURNING RATE, CAN PLASTICS FILL AIRCRAFT AND TRANSIT NEEDS**

Government pressure, in the form of guidelines, proposed rules and actual requirements, is forcing companies building airplanes, subways and buses to look for materials that provide better burning characteristics. A number of plastics producers either have announced or are planning to announce grades that are substantial improvements over existing ones for panelling, seating and glazing. The question is-are these plastics adequate? Beyond this question, extensive research in many areas such as toxicity may change existing requirements and thus again the status of materials being considered.

Houston, AM *Materials Engineering* Vol. 84 No. 2, Aug. 1976, pp 20-22

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**03 147900**  
**DESIGNING TRAINSETS FOR THE WORLDS FASTEST RAILWAY**

With work starting of the new Paris-Lyon high-speed route, SNCF has finalized the design and ordered two preproduction trainsets to be completed in 1978. These will be the first of 85 10-car TGV trains for the service to be initiated in 1981 and 1982. The aim of the design of these trains, capable of covering the 425 km in 2 hours, will be performance and technology unmatched by any other rolling stock. SNCF has conducted extensive prototype testing and will do the same with the preproduction trains. Details of the trains and their propulsion system are included. Each will consists of two power cars and eight trailer bogies in the push-pull mode with 25kv AC propulsion.

Garde, R (French National Railways) *Railway Gazette International* Vol. 132 No. 12, Dec. 1976, pp 464-692, Fig.

ORDER FROM: ESL

DOTL JC

**03 148252**  
**IMPACT OF FINITE ELEMENT ANALYSIS ON THE RAILROAD INDUSTRY**

In recent years finite element methods have become an accepted means of structural analysis through industry, and the manufacture of freight cars is no exception. Over the past decade, both static and dynamic methods have been used to analyze covered and open top hoppers, flat cars for container and auto rack service, gondolas and box cars. Past analysis techniques have given way to the faster more reliable finite element methods.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

McNally, GS Lee, SH Dehner, JL  
American Society of Mechanical Engineers Conf Paper Paper GP-3, 1976, 9 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

**03 148254**  
**DEVELOPMENT OF DESIGN LOADS CRITERIA FOR HIGH SPEED RAILCAR TRUCKS**

A brief summary of static and fatigue test results is given. Mention is made of the strain gage instrumentation and calibration of the truck and components for load measurement during running tests. The running tests load results are presented in maximum value, parametric, and spectra forms. The measured results are then compared to the original loads criteria for determination of adequacy of the prototype truck strength. Finally, a revised loads criteria is provided should a production truck be designed.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Sandlin, NH (Vought Corporation)  
American Society of Mechanical Engineers Conf Paper Paper D&O-32, 1976, 8 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

**03 148275**  
**FEASIBILITY OF FLAW DETECTION IN RAILROAD WHEELS USING ACOUSTIC SIGNATURES**

The feasibility study on the use of acoustic signatures for detection of flaws in railway wheels was conducted with the ultimate objective of development of an intrack device for moving cars. Determinations of the natural modes of vibrating wheel under various conditions are reported. Differences in acoustic signatures are found between good and cracked wheels, including spectral changes and variations in the time decay of sound. Various sound occurring in normal railroad practice, such as rolling noise on welded rail and over joints and retarder screech were investigated. It was concluded that special purpose impacters will have to be used for a servicable device. Pattern recognition techniques were used for selecting good and bad wheels with a computerized processing scheme. A laboratory demonstration system has been constructed and found to be 85% reliable when system malfunctions are discounted.

Research was sponsored by the Federal Railroad Administration, DOT, under contract to the Transportation Systems Center, Cambridge, Massachusetts.

Nagy, K Finch, RD  
Houston University, (DOT-TSC-FRA-76-6) Final Rpt. FRA/  
OR&D-76-290, Oct. 1976, 206 pp, Figs., Tabs., 27 Ref., 5 App.

Contract DOT-FR-30002

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

04 052957

**FILTRATION OF THE COMBUSTION AIR AND THE COOLING AIR OF INTERNAL COMBUSTION ENGINES, AND COOLING AIR FOR ELECTRIC MACHINERY ON LOCOMOTIVES. PART A: AIR FILTRATION. REPORT OF ENQUIRY**

The present report gives an account of the research undertaken by several Member-Administrations of ORE on the two following subjects: Determination of the dust content of air absorbed by rolling stock, and filtration of the combustion air of internal combustion engines, and cooling air for electric machinery on Diesel and electric locomotives and air conditioning on vehicles. As far as the former field of studies is concerned, the studies undertaken have not been very numerous and the results of what systematic measurements were made are not yet definitely known. As regards the latter field, some Member-Administrations have however undertaken comparative tests on filters; they have also defined the conditions for the cleaning of the filters used by them on their rolling stock. Some of them have standardized the dimensions of some types of filters and a few Administrations have compiled a technical specification for the supply of filters. The report concludes that additional studies would be useful in order to supply solutions of general application as regards the problem of air filtration.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B67/RE /E, June 1963, 34 pp, 16 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

04 052958

**FILTRATION OF COMBUSTION AIR AND COOLING AIR OF INTERNAL COMBUSTION ENGINES AND COOLING AIR FOR ELECTRIC MACHINERY ON MOTIVE POWER UNITS. PART B: INFILTRATION OF SNOW. SUPPLEMENTARY ENQUIRY (WINTER 1962/63)**

In the conclusions of Report B 67/B "Infiltration of snow", June 1963 edition, the Rapporteur proposed that the experience gained by the Administrations in the severe winter of 1962/1963 (heavy snowfall at extremely low temperatures) should be collected by means of a supplementary enquiry. The present report contains the results of this enquiry. As to the behaviour of the air-gratings and air-filters relative to the infiltration of snow, the data compiled in the first report were confirmed. The extreme weather conditions in the winter of 1962/1963 led, however, to break-downs of motive power units, which, for the major part, require measures in addition to the mere installation of air-gratings and filters. Technical and operational improvements introduced by the Administrations are described in the report. The proposal of ORE for a further study of the question "winter resistant motive power units" has been incorporated in the Chapter "Conclusions".

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B67/REC/E, June 1964, 36 pp, Figs., 10 App.

ACKNOWLEDGMENT: UIC  
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04 052959

**FILTRATION OF COMBUSTION AND COOLING AIR ON LOCOMOTIVES. RESEARCH MADE IN 1964 ON THE CHARACTERISTICS OF THE SORTS OF DUST TO BE FILTERED ON MOTIVE POWER UNITS (DETERMINATION OF ONE OR MORE TYPES OF DUST)**

After the presentation in June 1963 to the Control Committee of ORE of a Report of Enquiry concerning the filtration of air on rolling stock, the Specialist Committee B 67 was set up in order to compile a technical specification for the supply of air filters and for this purpose it also established the indicated Programme of Work. During its studies made in 1962, the SNCF had already obtained provisional results (under special and local conditions) concerning the dust floating in the air sucked-in. At the proposal of the Specialist Committee B 67, the SNCF continued its research from 1964 in order to determine the properties of the dust suitable to serve as a basis for the tests on air filters in the laboratory. The present report

indicates the conditions under which the research was made in 1964; it also contains a description of the sampling methods and the analyses applied, the procedures adopted and the instruments used. It gives an account of the difficulties encountered, the results obtained and it explains the differences between those obtained in 1962 and 1964. The method for drawing samples could be improved. It can, however, already now be stated that under the conditions under which the tests in the track were made on the system of the SNCF the dust content of the air take-in is very small and the majority of the dust particles have dimensions smaller than 10 microns. On the strength of the results obtained, a typical sort of dust has been chosen for the tests in the laboratory.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. B67/RP 1/E, Oct. 1966, 15 pp, 10 Fig., 7 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

04 052960

**FILTRATION OF THE COMBUSTION AIR AND THE COOLING AIR OF MOTIVE POWER UNITS. TESTS ON FILTERS IN THE LABORATORY**

This report deals with the operating tests on air filters carried out on behalf of the B 67 Specialist Committee. Their purpose was to ascertain whether, according to the quantity of dust retained, the filters used in service showed similar pressure drops to the filters tested in laboratory with the type of dust defined in report No. 1 and using the concentrations selected for the tests described in report No. 2. Results show severe scatter of the points measured, but with a few exceptions, the points measured were within the range of pressure-drop curves ascertained in the laboratory tests. The number of measurements was too small for any general quantitative validity to be given to them. Despite the limited number of tests made, it can be assumed that, qualitatively, the results of the laboratory tests are transferable to the practical field concerning the pressure drop measured. The analysis of the results obtained shows that the efficiency and pressure drop of the filters varies to a lesser or greater degree on the quantity of dust presented to the filter and that, in some cases, the values obtained with a concentration of 10 mg/cm<sup>3</sup> differ from those corresponding to 100 mg/cm<sup>3</sup>. The conclusion of the report is that the filter tests on the test rig permit the characteristics of the different filters to be compared with each other under given experimental conditions.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B67/RP 2/E, Oct. 1968, 33 pp, 51 Fig., 6 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 052961

**FILTRATION OF THE COMBUSTION AIR AND THE COOLING AIR OF MOTIVE POWER UNITS. OPERATING TESTS WITH AIR FILTERS**

Restrictions on the use of this document are contained in the explanatory material. 1 of 711A This report deals with the operating tests on air filters carried out on behalf of the B 67 Specialist Committee. Their purpose was to ascertain whether, according to the quantity of dust retained, the filters used in service showed similar pressure drops to the filters tested in laboratory with the type of dust defined in report No. 1 and using the concentrations selected for the tests described in report No. 2. Results show severe scatter of the points measured, but with a few exceptions, the points measured were within the range of pressure-drop curves ascertained in the laboratory tests. The number of measurements was too small for any general quantitative validity to be given to them. Despite the limited number of tests made, it can be assumed that, qualitatively, the results of the laboratory tests are transferable to the practical field concerning the pressure drop.

International Union of Railways B67/RP 3/E, Apr. 1969, 6 pp, 4 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 052962

**FILTRATION OF THE COMBUSTION AIR AND THE COOLING AIR OF MOTIVE POWER UNITS. INVESTIGATIONS CARRIED OUT BY THE SNCF IN THE FIELD OF DUSTS AND AIR-FILTERS**

This report forms the final reports of the B67 Committee. Besides a short account of the work of the Committee, it deals with the most important investigations carried out by the SNCF concerning the dust sucked in by motive power units and air filtration. The following work is described: Air sampling, Investigations on filters on the experimental vehicle, and Laboratory tests on filters.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. B67/RP 4/E, Oct. 1969, 55 pp, 31 Fig., 31 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 052984

**WINTER-RESISTANT MOTIVE POWER UNITS. INFILTRATION OF SNOW THROUGH THE AIR FILTERS OF MOTIVE POWER UNITS AND OTHER WINTER PROBLEMS**

Among the winter problems requiring a solution at the time of the setting up of the B 100 Specialists Committee, that of the infiltration of snow into motive power units headed the list. The present report describes the tests carried out on several types of air filters to determine the characteristics of these under winter conditions. During tests carried out at the Vienna Arsenal Testing Station, notable differences were observed between the different types of filter tested. The report gives an account of the tests and comments upon the results obtained. In the second part of the report, the performance of starter batteries at low temperatures is examined. The purpose of this investigation was to determine to what extent low battery temperatures impaired the starting process of a diesel engine. Although the tests intended for simulating the starting process at very low temperatures (-20 degrees C) could not so far be carried out, the test results obtained at battery temperatures down to -10 degrees C would seem to indicate that, at lower temperatures, difficulties due to the batteries themselves could arise. The third part of the report contains a survey of the routine measures taken by the various Administrations in winter concerning diesel motive power units. Finally, some recommendations are given, based on the results obtained.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B100/RP 1/E, Oct. 1968, 23 pp, 45 Fig., 3 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 052985

**WINTER-RESISTANT MOTIVE POWER UNITS. DRAFT OF TECHNICAL SPECIFICATION FOR THE SUPPLY OF ALKALINE AND LEAD-ACID STARTER BATTERIES**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. B100/RP 2/E, Apr. 1970, 21 pp, 1 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 053000

**NOISE ABATEMENT ON DIESEL LOCOMOTIVES. FAN NOISE**

The properties and constructional characteristics of different types of ventilators with respect to noise-production are discussed. It is shown that noise produced by ventilators can be suppressed only to a limited extent (Chapter 3). However, provided that it is designed with care, every ventilator can be effectively damped (Chapters 5 and 6). Since each application,

involving certain constructional, thermal and functional requirements, demands a particular ventilator (Chapter 4), efforts should be made to develop quiet ventilation systems by appropriate dimensioning. Silencers provide a simple means of reducing the noise of ventilators. Space for these should be allowed for when designing. Data on the fan noise of modern locomotives is contained in a supplement to this report, and is used as far as possible as a basis for establishing general standard values.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B104/RP 4/E, Apr. 1969, 38 pp, 32 Fig., 8 Tab., 6 Phot.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 053019

**STANDARDISATION OF DIESEL LOCOMOTIVES. ORE CODE FOR STANDARD DIESEL LOCOMOTIVES. (CANCELS FEBRUARY 1956 EDITION)**

Table of contents. (1) Standardization and classification of diesel locomotives; (2) Devices for the control, for the indication of defects to the driver and for the automatic protection of those elements producing or transmitting the traction or heating energy; (3) Drivers' cabs; (4) Wheel diameter and thickness of wheel tires; (5) Pneumatic brake equipment; (6) Equipment for the supply and distribution of compressed air.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B13/RP 1/E, June 1964, 23 pp

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 053020

**STANDARDISATION OF DIESEL LOCOMOTIVES. MANUAL FOR THE CARRYING OUT OF TYPE TESTS ON DIESEL ENGINES ACCORDING TO UIC LEAFLET 623**

The present manual was compiled on the basis of the experience gained in the course of type tests made on Diesel engines under the ORE homologation procedure. The object of this manual is to adequately specify the details involved in the carrying out of each of the instructions appertaining to the application of the homologation regulations, laid down in Interim Report B 13/RP 4, so that all type tests made under the supervision of ORE should be carried out in similar conditions and should consequently produce comparable test results. The manual comprises 12 sections. The first eleven sections define, for each stage of the operations which constitute the type test according TO UIC Leaflet No. 623: the sequence of the measurements, the method of measurement, and the accuracy of the measurements. The fully detailed model of a test report constitutes the twelfth section.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. B13/RP 6/E, Oct. 1961, 20 pp, Figs., Tabs.

ACKNOWLEDGMENT: UIC  
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04 053021

**STANDARDISATION OF DIESEL LOCOMOTIVES. REGULATIONS FOR THE TESTS ON PROTOTYPES OF LOCOMOTIVES WITH INTERNAL COMBUSTION ENGINES UNDER THE SUPERVISION OF ORE**

In the Regulations for the Homologation of Diesel locomotives, the tests which a locomotive must undergo, under the supervision of ORE, before it can be admitted as a standard type in one of the ORE classes, are defined. The purpose of these tests is to verify, inter alia, that: the locomotive conforms to the general characteristics of the standard locomotives and to the special characteristics imposed for the class concerned; the behavior of the locomotive in normal service has been sufficiently tested to enable ORE to recommend the use of considerable series of this locomotive. Following assent of these tests, the locomotive is homologated for one of the classes.

The Regulations contained in Report B13/RP 5 do not apply therefore to those prototypes of locomotives of which one or more were built in order to test newly developed arrangements calling upon the use of new techniques and which locomotives do not necessarily belong to an ORE-class. Consequently, it is not intended to build large series of these locomotives in the near future. However, when such a prototype of a locomotive is subjected to tests or used in service on the system of a Member-Administration, it may be interesting for ORE to collect, on behalf of other Member-Administrations, the most accurate data on the possibilities afforded by this locomotive. The conditions under which ORE can follow the tests on a prototype and the extent of these tests, form the subject of the present Regulations.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B13/RP 7/E, Oct. 1961, 10 pp, 1 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 053022

**STANDARDISATION OF DIESEL LOCOMOTIVES. NOISE ABATEMENT ON DIESEL LOCOMOTIVES. REPORT ON THE TESTS CARRIED OUT AT CROY-ROMAINMOTIER FROM 5TH TO 10TH SEPTEMBER 1960**

The tests were carried out September 10-15, 1960 on the Swiss Federal Railways network at Croy-Romainmotier between Vallorbe and Lausanne. The report of these tests form the subject of this document and the conclusions which it is now possible to draw are given in a summary.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B13/RP 8/E, July 1962, 37 pp, 5 App.

ACKNOWLEDGMENT: UIC  
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04 053023

**STANDARDISATION OF DIESEL LOCOMOTIVES. NOISE ABATEMENT ON DIESEL LOCOMOTIVES SUPPLEMENT TO DOCUMENT NO. 8 (APPENDICES IV AND V)**

In August 1960 the Control Committee approved a programme of tests drawn up by the Specialists Committee B 13 with a view to the carrying out of systematic noise level measures on Diesel locomotives, selected according to an agreed type scheme. The tests were carried out from the 5th to the 10th September 1960 on a line of the CFF at Croy-Romainmotier, between Vallorbe and Lausanne. The various noises produced by the Diesel locomotives could be compared under similar conditions on the same section of track, both by means of subjective measurements and by means of measurements. Furthermore, the tests enabled a comparison to be made between the measuring procedures employed by the various Administrations. An account of these noise level tests carried out at Croy-Romainmotier is given in the ORE report B 13/RP 8. The present report B 13/RP 9 contains additional statistical analyses on the measuring results obtained in the course of the noise level tests. For a better understanding of the report, the various test series have been reproduced in a clear way in the next chapter. The acoustical bases, together with the definitions of the various measuring units, as well as more precise data concerning the 10 Diesel locomotives examined, are described in detail in Report B 13/RP 8.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B13/RP 9/E, Oct. 1962, 22 pp, Apps.

ACKNOWLEDGMENT: UIC  
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04 053024

**STANDARDISATION OF DIESEL LOCOMOTIVES. REGULATIONS FOR THE HOMOLOGATION BY ORE OF DIESEL LOCOMOTIVES LIABLE TO BE CHOSEN AS STANDARD LOCOMOTIVES**

No Abstract.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B13/RP 11/E, June 1964, 17 pp, 2 App.

ACKNOWLEDGMENT: UIC  
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04 053025

**STANDARDISATION OF DIESEL LOCOMOTIVES. MAINTENANCE OF DIESEL ENGINE CRANKSHAFTS**

The work of the Working Group B 13.9 on the maintenance of Diesel engine crankshafts which is summarised in Chapter 1 of this Report, has been done quickly, in fact, between the 11th January and the 20th July, 1965. The basis of this work was the comparison of the experience acquired by the Specialists. This comparison was done on the spot, that is to say, in the workshops of the different Administrations. The conclusions of the study B 13.9 contained in Chapters 2 and 3 of this report are partly general and partly in the sphere of concrete results. The general conclusions have shown the definite interest, for each Administration represented, of the information which the Specialists have exchanged in a manner that was particularly open, wide and deep. As far as the concrete results are concerned, these may be summarised as follow: A technical guide for the maintenance of crackshafts, which can be used directly by the workshops; this contains all the rules recommended at the present state of manufacturaing technique of diesel engines, the criteria deduced from these maintenance rules, for the use of the Specialists Committee B 13 in assessing the behaviour of crankshafts during the homologation procedures of diesel engines, indications of some investigations that it would be opportune to carry out in a wider circle of Administrations.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B 13/RP 12/E, Oct. 1965, 11 pp, Figs., 10 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 053026

**STANDARDISATION OF DIESEL LOCOMOTIVES. COLLECTIVE HEATING OF COACHES IN DIESEL-HAULED TRAINS. COST OF SUPPLYING STEAM AND ELECTRIC HEATING ENERGY**

After having compared the results of the investigations enumerated at the end of the account of the programme of work, the B 13 Specialists found that there were differences in the presentation of the electrical heating and of the steam heating results. In the case of electrical heating, the results of the different tests all tallied closely. In the case of steam heating, there was close agreement between all the results showing the mean values for a given number of service trains, but there was a certain scatter when isolated trains were concerned. As is known, steam heating is affected by the considerable losses which occur in the energy supply: steam expansion and heat losses in the main heating pipe, steam leaks resulting from the smallest fault in the installations and, in particular, at pipe couplings. The energy losses vary greatly from one train to another, depending on whether there are heating failures or not and whether the coaches of the train are at the beginning or at the end of the inspection cycle etc., but over the whole or part of the heating season the energy losses balance out to such an extent that the same total heating energy consumption, related to one coach and for a same ambient temperature, has been found in Great Britain, France, Austria and Poland. It is the extreme losses which are responsible for the differences found, on isolated trains, from the average energy consumption in service, measured in the four above-mentioned countries. For example, with an ambient temperature of 0 degrees C, these differences range: from minus 30% in the case of an isolated run without any heating failure and with a train of new DB coaches, i.e. when the losses are reduced to a minimum, to plus

28% with a train of BR coaches which could not undergo normal periodic inspection and plus 35% with this same train when the steam leakage was especially severe, i.e. when the leakage attained its maximum value immediately before the periodic inspection.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 13/RP 13/E, Apr. 1968, 29 pp, Figs., 8 App.

ACKNOWLEDGMENT: UIC  
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**04 053027**

**STANDARDISATION OF DIESEL LOCOMOTIVES. MAINTENANCE OF PISTONS, GUDGEON PINS, PISTON RINGS AND CYLINDER LINERS OF DIESEL LOCOMOTIVES**

This report reflects the results of the comparison and use, in the course of several years of joint collaboration within the ORE B 13 Committee and Working Group, of the experience acquired by ten European Railway Administrations with very advanced dieselisation. Only the technical side of maintenance is dealt with. The results are interpreted by a Technological Guide which comprises all the recommended rules in the present state of the art of the construction of diesel engines, a part of which, dealing with methods of assessment and repair, is directly usable by workshops, and by the standards derived from these rules for estimating the performance of pistons, rings and liners in the course of official homologation procedures of diesel engines. The report contains a terminology in five languages. In the same way, the Working Group has already prepared a report on the maintenance of diesel engine crankshafts (Report No. 12)

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 13/RP 14/E, Oct. 1969, 153 pp, 57 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC  
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**04 053028**

**STANDARDISATION OF DIESEL LOCOMOTIVES. ORE REGULATIONS FOR THE TESTING ON THE TEST-BENCH OF DIESEL TRACTION ENGINES LIABLE TO BE FITTED TO RAILWAY VEHICLES (100 HOUR TYPE-TEST AND 360 HOUR TEST)**

This document describes in detail the special tests of a new procedure for the testing of diesel traction engines on the test-bench. This test-procedure is primarily intended for the testing of new engines under international control by ORE, whereby a Railway Administration is not placed under any obligation to buy. The technical conditions of the procedure accurately simulate the requirements laid-down for diesel engines during the service tests and, consequently, permit the lengthy delays connected with such service-tests to be appreciably reduced. In order to alleviate the task of supervision, use is made of automatic control devices and recording instruments.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B13/RP 15/E, Oct. 1970, 33 pp, 1 Fig., 18 Tab.

ACKNOWLEDGMENT: UIC  
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**04 053029**

**STANDARDISATION OF DIESEL LOCOMOTIVES. PREVENTION OF CORROSION IN DIESEL ENGINE COOLING CIRCUITS. (TEXT AND APPENDICES)**

The Report, resulting from a comparison between the experience obtained by eight Administrations, gives a description of the various aspects of the damage caused by corrosion and a study of its process of development. It contains indications concerning the various measures which can be taken to prevent and repair such damage, and, in particular, details regarding the

processes adopted for water treatment. Following acceptance (homologation) tests on engines, proposals are made regarding the limit values which can be allowed as far as the various types of corrosion are concerned. Information is given regarding the studies to be pursued or to be undertaken. The report also contains an extensive bibliography, a glossary in 5 languages and an album with photographs of corrosion phenomena on various components, particularly cylinder liners and cylinder blocks. The Working Group has already compiled two reports relating to the maintenance of diesel engines, one concerning crankshafts (Report No. 12), the other concerning pistons, gudgeon pins, piston rings and cylinder liners (Report No. 14).

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 13/RP 16/E, Oct. 1970, 240 pp, 65 Fig., 17 App.

ACKNOWLEDGMENT: UIC  
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**04 053030**

**ACCEPTANCE TESTING AND MAINTENANCE OF DIESEL ENGINES. REGULATIONS FOR THE OFFICIAL ACCEPTANCE TESTING BY ORE OF DIESEL TRACTION ENGINES LIABLE TO BE FITTED TO RAILWAY VEHICLES**

This document defines the tests to which diesel traction engines should be submitted with a view to their official acceptance by ORE. These tests, the main part of which is carried out in railway service under international control by ORE, are the most suitable for meeting the needs of the user. They also offer a high guarantee with regard to the assessment of the running qualities of an engine on board a vehicle. In addition, a recommendation at international level allows the builder to assume that an equipment which has successfully undergone such stringent tests will enjoy a wider diffusion.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 13/RP 17/E, Apr. 1972, 28 pp, 1 Fig.

ACKNOWLEDGMENT: UIC  
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**04 053031**

**ACCEPTANCE TESTING AND MAINTENANCE OF DIESEL ENGINES. MAINTENANCE OF FUEL INJECTOR OF DIESEL ENGINES**

This report has been drawn up on the basis of the comparison of experience gained by eight administrations. It summarises the general ideas which these administrations hold and lists the various types of defects most frequently encountered, their causes and usual development, and also the checking and testing methods most usually adopted. It also proposes the limits of defects which can be accepted in the homologation tests and provides a list of terms in five languages. The Working Party has already prepared four reports on the maintenance of diesel engines. These cover: crankshafts (Report No. 12); pistons, gudgeon pins, piston rings and cylinder liners (Report No. 14); means of counteracting corrosion in the cooling circuits (Report No. 16); cylinder heads, valves and cylinder head accessories (report No. 18).

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B 13/RP 19/E, Apr. 1975, 73 pp, 13 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

**04 130057**

**REFERENCE BOOK FOR YARD REPAIRS OF ELECTRIC TRAINS. ELECTRICAL EQUIPMENT [Spravochnik po depovskomu remontu elektropoezdov. Elektricheskoe oborudovanie]**

This book presents reference materials for the maintenance and inspection (e.g. technical and preventive inspection, minor and major periodical repair; elevation and factory repair), norms of tolerance and wear and tear, construction and technical data for the electrical equipment of the SR3 electrical section and the ER1, ER2, ER22, ER9, and ER9P electric trains.



It also contains an enumeration of technological documentation. Subsections cover electrical apparatus, current collectors, filters, contactors and switches (e.g. electropneumatic, electromagnetic, cam), relays, resistors, and frequency meters. This reference book is intended for metal workers maintaining electrical trains, foremen, and depot technical engineering workers; it may also be useful for those studying in technical schools, working on railroads and in factories, and connected with the maintenance of motorized wagon rolling stock and sequence preparation of maintenance and locomotive teams. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Kurchashova, VA  
Transport Publishing House 1974, 360 pp, 206 Fig., 97 Tab., 16 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

**04 130207**  
**ELECTRIFIED ROLLING STOCK WITH SEMICONDUCTOR RECTIFIERS [Elektropodviznoi sostav s poluprovodnikovymi preobrazovatel'nyimi]**

This publication presents the following reports: (1) The results of tests of the VL80 electric locomotive under operating conditions; (2) The adhesion coefficient of electric freight locomotives; (3) The operational effectiveness of electric locomotives with alternating current and dynamic braking on thyristor transformers; (4) Energy indices of AC electric locomotives with regenerative braking; (5) Partial artificial commutation during regenerative braking of AC rolling stock; (6) Methods for increasing the effectiveness of regenerative braking on AC rolling stock; (7) Investigations into impulsive regulation of current on experimental ER2I-CNII AC electric section; (8) Semiconductor high-voltage transformer with 30 kv power for passenger car with air conditioning; (9) Theoretical analysis of input filter of the DC EPS transformer with current regulation; (10) Starting the compressor motors of AC electric locomotives at reduced temperature (11) Regenerative braking on electric locomotives with rectifiers; (12) Results of tests on electric locomotive with rectifiers; (13) Influence of temperature on parameters of voltampere characteristics parallel to silicon rectifiers; (14) The calculation of electromagnetic processes in auxiliary machine systems according to experimental parameters of non-symmetrical phase splitting; (15) The results of operational tests of the experimental model VL60kv electric locomotive. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 476, 1972, 176 pp, 101 Fig., 13 Tab., 69 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

**04 130310**  
**PERSPECTIVES OF ELECTRIC LOCOMOTIVE DEVELOPMENT [Perspektivy razvitiia elektrozovov]**

Electrified railroads today make up half of the transport network; the next five-year plan intends to electrify six to seven thousand more kilometers of railroad. This study examines the fundamental possible directions for the technical improvement of electric locomotives, developing out of operational experience and traction energy research. The report covers fundamental parameters of prospective electric locomotive loads, possibilities of achieving necessary parameters, and finally, directions of development of electric passenger locomotives. [Russian]

Corporate author and availability information not provided. Abstract only is available in English, original untranslated as of November 1976.

Tikhmenev, BN No Date, 8 pp, 4 Fig., 3 Tab.

ACKNOWLEDGMENT: FRA

**04 136409**  
**TRACKSIDE TEST PROGRAM FOR REGENERATIVE CHOPPER-CONTROLLED SUBWAY CARS**

Six subway cars in Toronto were retro-fitted with a chopper control system which also provides regeneration capability during braking cycles. Testing

was concurrent with a test program to evaluate vehicle performance. Trackside testing identified and investigated the level of chopper-produced interference in signals, communication, data transmission, remote supervisory control and traction power systems, Safety considerations, such as the possibility of sustained voltage on de-energized contact rail sections, were also investigated. Energy consumption of the chopper-equipped cars was expressed as a percentage saving compared with that of conventional cars.

Presented at the Am Transit Assoc Rail Transit Conf., San Francisco, Calif., Apr. 14 and 16, 1974, Power and Signals Sess. NTIS Nos. PB-234 824; PB-234 825 and PB-234 826.

Ledsham, HT (Toronto Transit Commission)  
American Transit Association ATA/RT-74/1,2,3, 1974, pp 65-79

ACKNOWLEDGMENT: EI  
ORDER FROM: NTIS

DOTL NTIS

**04 137027**  
**DEVELOPMENT OF THE VALVED HOT-GAS ENGINE**

Continued development of the valved hot-gas engine (VHGE) is reported. The VHGE is a closed-regenerative-cycle engine operating on a helium Brayton cycle, and employing a reciprocating expander/compressor. The performance of the experimental engine was measured in detail, and is reconciled with analysis which includes the unsteady internal processes of the cylinder. Variable valve timing for high efficiency control of engine power was studied. Improvements were made to allow full power operation of the experimental engine. Projected potential of the engine is confirmed by identification of causes of lower than theoretical performance. The next steps in the realization of the potential of the engine are defined.

Smith, JIJ  
Massachusetts Institute of Technology, Department of Transportation  
Final Rpt. DOT/TST-76/34, Aug. 1975, 147 pp

Contract DOT-OS-40086

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-253151/5ST, DOTL NTIS

**04 137231**  
**HYDROGEN-FUELED INTERNAL COMBUSTION ENGINE, A TECHNICAL SURVEY OF CONTEMPORARY U.S. PROJECTS. ETA REPORT PR-51**

A special survey of contemporary U.S. hydrogen-fueled internal combustion engine research activities was conducted. The results, which considerably expand the previously available technical information baseline, are presented. Fourteen hydrogen engine research groups, with a wide range of backgrounds and organizational makeup, were found to have conducted experimental work of significance over the past five years. Some 49 hydrogen-air and hydrogen-oxygen internal combustion engines of both the piston and rotary combustion types are included in the resulting survey. Several of the organizations (over half) developed demonstration hydrogen-fueled vehicles; 15 of these were documented as well. Onboard hydrogen storage systems of the pressurized gas, cryogenic liquid, and metal hydride types were successfully employed. A wide range of technical options were explored in the various research engines, especially in the technique and equipment employed in hydrogen admission to the engines. The hydrogen engine's propensity for producing relatively high amounts of oxides of nitrogen (NO/sub x/) emissions when operated at high power settings was noted and, in the case of several of the projects, accurately quantified.

Escher, WJD  
Escher Technology Associates Sept. 1975, UII pp

ACKNOWLEDGMENT: NTIS  
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TEC-75/005, DOTL NTIS

**04 139461**  
**IMPROVING THE PERFORMANCE OF ADVANCED-DESIGN TRACTION SYSTEMS [Povyshenie effektivnosti progressivnykh vidov tjagi]**

The article describes the basic directions taken for the development of: technico-economic indices for electric and diesel traction, electric power

supply systems for tractive units, and passenger coaches. It goes on to show the possibilities for gas-turbine application, as well as the road ahead for the complex development of railway technical equipment. [Russian]

Dimitriev, VA *Zheleznodorozhnyi Transport* No. 3, 1976, pp 43-50

ACKNOWLEDGMENT: UIC

ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmanaya ul. 4, Moscow B-174, USSR

04 139472

**THE INFLUENCE OF OCCUPATIONAL FACTORS ON THE TECHNICAL HEAT AND FLOW CHARACTERISTICS OF COOLING SYSTEMS FOR DIESEL RAILWAY VEHICLES** [Der Einfluss betrieblicher Faktoren auf die warme und stromungstechnischen Charakteristken von Kühlelementen fuer Diesel-schienefahrzeuge] No Abstract. [German]

Panow, NI *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 22 No. 2, 1975, pp 331-342, 3 Tab., 10 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hochschule fuer Verkehrswesen — Friedrich List — Friedrich List Platz 1, Dresden 801, East Germany

04 139482

**GERMAN THREE-PHASE TRACTION DEVELOPMENT**  
The DB has commissioned Brown Boveri & Cie, Mannheim, to develop a high-power general-purpose electric locomotive with the aim to order five prototypes suitable for 160 km/h for service by 1978.

Teich, W *Railway Engineer* Vol. 1 No. 3, May 1976, p 47, 3 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

04 139484

**CREEP CONTROL FOR OPTIMUM ADHESION**  
With semi-conductors, the traction engine can control the transmission of power to the rail with greater finesse than ever before; but slip remains a problem. ASEA has now produced the near-ultimate aid in the fight for adhesion.

*Modern Railways* Vol. 33 No. 332, May 1976, pp 190-191, 1 Fig., 4 Phot.

ACKNOWLEDGMENT: UIC

ORDER FROM: XUM

DOTL JC

04 139486

**FOUR-WHEEL DRIVE**  
An examination of problems resulting from unequal wheel diameter to facilitate application of group drive.

*Railway Engineer* Vol. 1 No. 2, Mar. 1976, pp 22-24, 4 Fig., Refs.

ACKNOWLEDGMENT: UIC

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

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04 139497

**ASEA USES AXLE VIBRATION TO MEASURE CREEP AND OPTIMISE ADHESION**  
Investigation of the way slip takes place in driving wheels revealed that one wheel on an axle generally breaks into slip first, and this results in the development of torsional oscillations in the axle. This fact has been used on ASEA locomotives for a creep speed detection system, using a magneto-elastic transducer placed on the link which connects the gearbox to the bogie frame. The signal generated can be used directly to regulate the power supplied to the motor, and thereby increase the adhesion coefficient from 0.27 to 0.30.

*Railway Gazette International* Vol. 132 No. 2, Feb. 1976, p 67

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

04 139516

**CHOPPER ELECTRIC LOCOMOTIVE E-444.005 OF THE F.S.** [La locomotiva elettrica a chopper E-444.005 delle F.S.]  
A description is given of the new electric locomotive, still in an experimental phase, E444.005 of the Italian State Railways. Power feed remaining unchanged at 3,000 V, d.c. the use of techniques in the solid state in traction has made it possible to increase the continuous rating of each of the 4 motors to 1,125 kW against the 940 defined by the reference tension 3 kV/2 for the same motors of the original group. An illustration is given of the concepts adopted in the design of the body, the bogies and the motors; a description is then given of the traction and braking circuits and the control logic which is completely automated. Lastly, a description is given of the equipment for the auxiliary services and the reasons are given for the higher cost of the equipment as compared with similar traditional locomotives. [Italian]

Piscaglia, D Cavagnaro, M *Ingegneria Ferroviaria* Vol. 31 No. 1, Jan. 1976, pp 5-14

ACKNOWLEDGMENT: EI

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DOTL JC

04 139525

**LIVING WITH THE THYRISTOR**  
The thyristor enables the traction control engineer to realise his dream of an infinitely variable, fast and smooth power-controller. Signalling and telecommunication engineers fear this dream may be their nightmare. Results of recent trials on BR and LT put these fears into perspective.

*Modern Railways* Vol. 33 No. 334, July 1976, p 276, 1 Phot.

ACKNOWLEDGMENT: UIC

ORDER FROM: University Microfilms International 300 North Zeeb Road, Ann Arbor, Michigan, 48106

DOTL JC

04 139528

**COMMUTATOR FLASHOVERS IN TRACTION MOTORS**  
Report on experimental studies and laboratory measurements on the flashover conditions of arcs between brushes, and between brushholders and the frame. The author establishes a few recommendations as far as permitted stresses between commutator bars are concerned and with regard to flashover detection and arc extinguishing.

Kourbasov, AS *Rail International* Vol. 7 No. 6, June 1976, pp 321-327, 9 Fig., 9 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

04 141099

**FOUR-CYCLE LARGE ENGINES** [Viertakt-Groesstmotoren]  
After a brief historical review of the development of large medium-speed four-cycle engines, the paper investigates the limits of power increase. Piston speed and mean effective pressure have a variable influence concerning the thermal stresses of engine parts. Another section of this paper investigates the consequences, originating from largeness of engine parts, on design, engine components, and maintenance. The dimensions of the new generation of large medium-speed diesel engines demand and enable constructions which are different from previous solutions. [German]

Syassen, O (Augsburg-Nuremberg Machineworks) *MTZ Motortechnische Zeitschrift* Vol. 37 No. 5, May 1976, pp 173-178, 14 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 141113

**MEANS OF EXCITATION OF DC ELECTRIC TRACTION MOTORS BY MEANS OF THYRISTORIZED CONVERTERS** [Regulirovanie vozbuzhdeniya tyagovykh elektrodvigateli postoyannogo toka pri pomoshchi tiristornykh preobrazovatelie]  
Principles of control of the field of DC traction motors with series excitation by means of pulse switches connected in parallel to the excitation windings

are considered. Theoretical relations are presented and recommendations are given for the selection of the parameters of a system of smooth excitation control. [Russian]

Chausov, OG Titov, AG Feoktistov, VP *Elektrotehnika* No. 2, Feb. 1976, pp 17-19

ACKNOWLEDGMENT: EI  
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04 141440

**STARTING DYNAMICS OF A TRAIN WITH GIVEN MOTOR CURRENT CHARACTERISTICS [Anfahrndynamik eines Zuges bei gegebener Motorstromcharakteristik]**

The starting dynamics of a train depend on the motor current characteristics. The author establishes a system of differential equations describing this relationship. [German]

Sliwa, H *Elektrische Bahnen* Vol. 47 No. 4, Apr. 1976, pp 91-94, 1 Tab., 7 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

04 141442

**THE ASYNCHRONOUS MOTOR AND ELECTRIC TRACTION [Le Moteur asynchrone en traction electrique]**  
No Abstract. [French]

Desponds, M *Bulletin Technique de la Suisse Romande* Vol. 102 No. 12, 1976, pp 209-218, 1 Fig., 1 Tab., 11 Ref.

ACKNOWLEDGMENT: UIC  
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04 141458

**DYNAMIC LOADS IN THE TRANSMISSION OF LOCOMOTIVES WHEN THE PROFILE OF A TOOTH DEVIATES FROM THE INVOLUTES [Dinamiskekie nagruzki v ttagovoj peredace lokomotiva pri otklonenii profilja zuba ot evolventy]**

The article gives the theoretical and experimental results of dynamic research into geared transmissions. It proposes a method of calculating these transmissions when the active profile of a tooth deviates from the involute due to wear of the gear wheel in service. [Russian]

Ivanov, VN Beljaev, AI *Vestnik Vniizt* No. 3, 1976, pp 8-13

ACKNOWLEDGMENT: UIC  
ORDER FROM: Vestnik Vniizt 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

04 141644

**DYNAMIC CHARACTERISTICS OF DIESEL-ELECTRIC LOCOMOTIVES. COMPARATIVE ANALYSIS OF NEW AND CONVENTIONAL SOLUTIONS BY SIMULATION**

Conventional transmission techniques are compared with the electronic control method proposed by the author. Comparative studies of dynamic characteristics covered traction motor field shunting, sudden load variations and axle slipping tests. All factors which are essential for evaluation of the system were followed closely during the study (the generator current and voltage, angular velocity of the diesel engine and of a traction motor, i.e. the locomotive speed).

Jelic, S *Rail International* No. 8, Aug. 1976, pp 451-462, 11 Fig., 1 Tab., 11 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

04 141646

**THE RECTIFIER-FED RELUCTANCE MOTOR AS DRIVE FOR ELECTRIC MOTOR VEHICLES [Die stromrichtergespeiste Reluktanzmaschine als Antriebsmotor elektrischer Triebfahrzeuge]**

The problem of replacing commutator motors on electric motor vehicles by induction motors that are more powerful and more practical from the

maintenance angle can be resolved by using unipolar reluctance motors. The rotor of the unipolar machine is very robust because there are no windings, but this advantage is diminished by the problems arising from its high speed and the mode of excitation. The rectifier feed system is also indirectly responsible for special requirements which affect the size of the motor. [German]

Rentmeister, M *Glaser's Annalen ZEV* Vol. 100 No. 5, May 1976, pp 163-168, 5 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

04 141686

**10,000-HP ELECTRIC GOES TO CONRAIL FOR TESTS**

The GM10B, a six-axle, six-motor locomotive with three two- axle trucks, is part of Electro-Motive's long-range research and development program for meeting future motive power needs of customers in the U.S. and Canada. This is one of two prototype electric locomotives developed in cooperation with ASEA of Sweden where agreements cover non-exclusive licensing of the advanced thyristor type power unit. This 10,000-hp (diesel equivalent) electric locomotive has full thyristor motor control and separately excited traction motor fields providing individual motor control and stepless voltage control over the entire range of operations. Traction motors are a modified version of the ASEA European model LJM-108-1. The fabricated trucks combine low weight transfer and elastomeric suspension. Other constructional details are also given.

*Railway Age* Vol. 177 No. 18, Sept. 1976, pp 38-39, 1 Phot.

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04 142247

**CHARACTERISTICS OF SILICONE INSULATING OIL FOR ROLLING STOCK TRANSFORMER**

Japanese National Railways has used a nonflammable oil composed mainly of polychlorinated biphenyl (PCB) in the transformers on cars on the New Tokaido Line (25 kV) and conventional equipment (20 kV). Japanese legislation prohibited use of PCB in July 1972; JNR then sought a non-PCB oil. The new rolling-stock transformer oil is dimethyl silicone oil with viscosity of 25 cST (25 C). Extensive tests have indicated the relation between insulating characteristics and water content, oil temperature, and flammability.

Garan, S Amekura, K  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 12-13, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

04 142277

**PRESENT STATE OF STUDIES AND TESTS ON INTERFERENCE CAUSED BY TRACTIVE UNITS WITH CONVERTERS IN THE CFF [Stand der untersuchungen uber die Stoerbeeinflussung von Stromrichter-Triebfahrzeugen bei den SBB]**  
No Abstract. [German]

Huber, J Winter, P *Bulletin des Schweizer Elektrotech Vereins (SEV)* Vol. 67 No. 14, 1976, pp 719-724, 3 Tab., 9 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Association of Swiss Electricians Seefeldstrasse 301, 8008 Zurich, Switzerland

04 142294

**IMPROVED ENGINE PROTECTION BY MEANS OF RETARDED OVER-VOLTAGE RELAYS WITH PROTECTION AGAINST PHASE VOLTAGE DROPS [Verbesserter Motorschutz durch thermisch verzogerte Ueberstromrelais mit Phasenausfallschutz]**  
No Abstract [German]

Edlmayr, F *Elektrotechnische Zeitschrift, Ausgabe B* Vol. 28 No. 11, May 1976, pp 339-341, 1 Tab., 7 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

**04 142302**  
**EFFECTS OF BRUSH FRICTION ON THE OVERHEATING OF THE COMMUTATOR** [Einfluss der Buerstenreibung auf die Kommutatorerwaermung]

With the previous method of measuring overheating of the commutator, it was only possible to do so by stopping the motor after running under load. The new method using an infra-radiation pyrometer allows measurements to be made during running. It was also observed that commutators can become overheated without current when the number of r.p.m. is very high. The author sums up the results of studies and tests on the coefficient of friction, carried out by the OBB. [German]

Rotter, R. *Elektrische Bahnen* Vol. 47 No. 5, May 1976, pp 105-112, 4 Fig., 2 Tab., 4 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

**04 142310**  
**STAGES IN THE EVOLUTION OF ELECTRIC LOCOMOTIVE CONSTRUCTION IN THE USSR** [Etapy razvitiya otecestvenogo elektrovozstroenija]

The article gives the main parameters of Russian electric locomotives, shows the main alterations made to their circuits as well as to their electrical and mechanical details since the start of railway electrification in the USSR, and explains the pattern of future development for electric locomotives in this country. [Russian]

Bystrickij, HJ Dubrovskij, ZM *Zheleznodorozhnyi Transport* No. 6, 1976, pp 20-25, 2 Fig., 3 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novo-Basmanaya 4, Moscow B-174, USSR

**04 142521**  
**ELECTRONICS IN A.C. TRACTION VEHICLES**

Contents: Design concept of electronic control systems for traction vehicles with phase-angle control, by R. Zwahlen and W.U. Bohl; The LZB-ORE continuous automatic train control system, by V.M. Bogdan and H.J. Hahn; New suburban motor-coach compositions, class RABDe 8/16, of the Swiss Federal Railways, by J.C. Schaffner, A. Bautz and P. Vilpert; Bo'Bo' thyristor locomotives, class 1044, of the Austrian Federal Railways, by F. Kuhrer; The regenerative brakes of the thyristor locomotive Ee 3/3 II of the Swiss Federal Railways, by R. Ruegg; Dual-power locomotives, type Tem 2/2, of the Berne-Lotschberg-Simplon Railway (BLS), by G. Roth; Power supply to electronic equipment on traction vehicles and ships, by J. Milavec.

*Brown Boveri Review* Vol. 62 No. 12, Dec. 1975

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**04 142528**  
**APPRAISING THE GAS TURBINE**

Ten years after the aerospace-derived gas-turbine began to be promoted as the ideal lightweight rail traction prime mover it is being abandoned because its thirst does not suit the new energy situation. Is it curtains for the traction gas-turbine? Basic research in the USA gives some facts with which to appraise the turbine's future.

*Modern Railways* Vol. 33 No. 335, Aug. 1976, pp 318-320

ACKNOWLEDGMENT: British Railways  
ORDER FROM: University Microfilms International 300 North Zeeb Road, Ann Arbor, Michigan, 48103

DOTL JC

**04 142539**  
**FILTER CIRCUITS FOR HIGH POWER LEVELS** [Siebketten fuer Hohe Leistungen]

Theoretican investigations of filter circuits for the DC link in railway traction systems are considered. The mathematical treatment of the

conventional arrangement of the filter circuit between rectifier and motor current circuit yields the characteristic of currents and voltages with respect to time during the transient period and in the steady state. By reference to the results of numeric calculations it is shown how information may be obtained about the space requirement and weight of a filter circuit for high transit power and definite smoothing properties. [German]

Kaemmerer, H Voigt, H *Wissenschaftliche Berichte AEG-Telefunken* Vol. 48 No. 4, 1975, pp 165-170

ACKNOWLEDGMENT: EI  
ORDER FROM: Elitera Verlag Fritz-Wildungstrasse 22, 1 Berlin 33, West Germany

**04 142541**  
**SOLID STATE CONTROL SYSTEMS FOR THYRISTOR TRACTION VEHICLES OF THE SOCIETE NATIONALE DES CHEMINS DE FER FRANCAIS (SNCF)**

Series 15,000, B'B' locomotives of SNCF have been equipped with solid-state start and speed control systems with integrated antislip devices. The locomotives operate with phase-angle control. Good results obtained from prototype equipment in service led to the decision by SNCF to equip a large number of up-to-date traction vehicles with the speed control system discussed in this article.

Gernier, JP Riondel, PP *Brown Boveri Review* Vol. 63 No. 3, Mar. 1976, pp 160-167

ACKNOWLEDGMENT: EI  
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**04 142589**  
**PERFORMANCE OF ELECTRIC LOCOMOTIVES**

Performance figures are given for three typical designs of electric locomotive of the German Federal Railway which have been in use for 10 years. The performance figures include tractive effort and coefficient of adhesion as a function of axle loading and slip for wet and dry rails. Tire wear and the factors affecting it are discussed and test results for electric, steam and diesel traction are quoted. Reference is made to the poor utilization factor of thyristor installations operating at comparatively high delay angles and at attempts at improvement by the use of forced commutation of the thyristors. [German]

Gladigau, A. *Elektrische Bahnen* Oct. 1972, pp 230-238, 6 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: ESL

DOTL JC

**04 142591**  
**USE OF THREE PHASE A.C. DRIVE MOTORS FOR RAILROAD VEHICLES**

It is shown that with its wide ranging voltage and frequency control facilities, static converter technology facilitates the use of three-phase a.c. motors. [German]

Kuhlow *Glaser's Annalen ZEV* July 1974, pp 245-251, 19 Ref.

ACKNOWLEDGMENT: FRA  
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DOTL JC

**04 142593**  
**THE ELECTRICAL EQUIPMENT OF THE ET403 HIGH-SPEED MULTIPLE-UNIT TRAIN**

A detailed account is given in two parts of the engineering aspects of the ET403 whose specification includes the following features: power supply 15 kV, 16-2/3 Hz; maximum speed 200 km/h; acceleration 0.6 m/sq s, braking deceleration 0.9 m/sq s; number of driven wheel-sets in the four-vehicle basic train, 16. The power control is based on the phase-switched thyristor technique. [German]

The article appears in two parts: Part 1, pp 118-130; Part 2, pp 153-161.

Koller, H Lossel, W Winden, R. *Elektrische Bahnen* June 1973

ACKNOWLEDGMENT: FRA  
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04 142594

**NEW ELECTRIC DUAL FREQUENCY LOCOMOTIVE FOR DB TYPE 181.2**

In two parts this article describes the type 181.2 locomotive built by AEG/Telefunken and Krupp GMBH which can operate on single phase 15 kV, 16-2/3 Hz or 25 kV, 50 Hz. DB has 25 of these units. [German]

The second part of the article appears in the June 1975 issue, pp 137-147.

Guthlein, H Tietze, C *Elektrische Bahnen* May 1975, pp 105-118, 12 Ref.

ACKNOWLEDGMENT: FRA

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04 142595

**THREE PHASE TECHNOLOGY--NEW POSSIBILITIES FOR THE ELECTRIC TRACTION RAILWAY**

Lists advantages of the asynchronous motor drives in terms of higher tractive effort, better adhesion, lower maintenance and improvement of the load p.f. Concludes by reporting R&D progress achieved and reviewing the anticipated future advantages. [German]

Wolters, H *Die Bundesbahn* Nov. 1975, pp 687-692

ACKNOWLEDGMENT: FRA

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

04 142596

**ELECTRIC LOCOMOTIVE WITH BRUSHLESS TRACTION MOTORS**

The author compares the requirements of railway operation with present-day technical possibilities of electric drive methods, and discusses initial experience with the BBC/Henschel DE 2500 diesel-electric locomotive and the BBC prototype a.c. locomotive, and their significance for high-powered electric train running. Function and layouts of the switchgear for non-commutator asynchronous traction motors are described in detail. [German]

Koerber, J *Eisenbahntechnische Rundschau* July 1975, pp 251-259, 8 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

04 142597

**BEHAVIOR OF ELECTRIC TRACTION USING PHASE ANGLE CONTROL IN RESPECT TO NEEDS FOR REACTIVE AND APPARENT POWER ON INTERURBAN SERVICE**

A very interesting set of data derived during field testing of two popular German types of electric locomotives: The 181, which uses phase control, and the 110 which controls speed by means of transformer taps. [German]

Schaefer, H *Elektrische Bahnen* Aug. 1971, pp 170-175, 7 Ref.

ACKNOWLEDGMENT: FRA

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04 144080

**DEVELOPING A 15 KV SINGLE-PHASE ELECTRIC LOCOMOTIVE WITH THREE-PHASE INDUCTION MOTORS**

Development of five electric locomotives, Class E 120, with three-phase brushless traction motors has been initiated by German Federal Railway after extensive tests with prototype diesel-electrics built in 1971. A 1400 kW traction motor had been produced for the new Bo-Bo units which are to be in service by 1979 and are to be prototypes of a new series of DB electrics. One of the original diesels is being converted for use in the Netherlands as a 1500 V DC electric locomotive with dc/dc/three-phase power conversion.

Korber, J *Railway Gazette International* Vol. 132 No. 10, Oct. 1976, pp 381-384, 4 Fig.

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04 145136

**THREE-PHASE TRACTION: PROBLEMS AND PROSPECTS**

Semiconductor devices have now developed to the point where producing a three-phase supply of varying voltage and frequency aboard a train is quite feasible. The many advantages of the brushless three-phase induction motor have long been recognised by traction engineers, and this could well be the next major development in both diesel and electric motive power as work proceeds in several countries. Up to now, however, only pilot fleets of locomotives have been ordered and the cost of power conditioning equipment remains an obstacle to the general adoption of three-phase drives.

Stokes, R (British Railways) *Railway Gazette International* Vol. 132 No. 11, Nov. 1976, pp 419-422, 6 Fig., 16 Ref.

ACKNOWLEDGMENT: Railway Gazette International

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04 145146

**ELECTRIFICATION AND NEW ELECTRIC LOCOMOTIVE DESIGNS**

The new Models GM-6 and GM-10 electric locomotives designed for heavy-duty freight service are reviewed in this paper. These are provided with the most modern thyristor control and include a number of new and novel features. In terms of tractive effort capabilities and wide range of horsepower capabilities horsepower capabilities, the GM-10 locomotive is believed to be the most powerful locomotive ever built in the world. At a time when electrification projects are being undertaken in many countries of the world, it is timely to consider some of the interesting factors affecting electrification of U.S. railroads which are discussed in this paper.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Ephraim, M, Jr Quinn, HE (General Motors Corporation)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-7,  
Dec. 1976, 9 pp, 7 Fig., 2 Tab., 6 Ref.

ACKNOWLEDGMENT: ASME

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04 145159

**THREE-PHASE TRACTION DRIVE WITH FORCED CURRENT LINK-CIRCUIT CONVERTERS [Drehstromtraktionsantrieb mit Stromeinpraegendem Zwischenkreisumrichter]**

Two convertor configurations with d.c. current link are described, which produce low reactive power by means of two-step line and forced commutation of the line current. Low frequency torque oscillations are avoided using multiple pulse control of the load current. [German]

Lienau, W (Technical University of Aachen, West Germany);

Mueller-Hellmann, A *Elektrotechnische Zeitschrift, Ausgabe A* Vol. 97 No. 2, Feb. 1976, pp 84-86, 9 Ref.

ACKNOWLEDGMENT: EI

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04 145161

**ELECTRONIC CONTROL OF SGM SPRINTER TRAINS OF THE NETHERLANDS RAILWAYS (NS)**

This article describes the electronic control system for the "Sprinter" suburban motor-coach trains of the Netherlands Railways (NS), which are equipped with a conventional contactor control system and series-parallel regrouping of the traction motors.

Garnier, JP *Brown Boveri Review* Vol. 63 No. 3, Mar. 1976, pp 168-172

ACKNOWLEDGMENT: EI

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04 147710

**FUEL EFFICIENCY IMPROVEMENT IN RAIL FREIGHT TRANSPORTATION: MULTIPLE UNIT THROTTLE CONTROL TO CONSERVE FUEL**

From the results of the tests performed on the Kansas City Southern in regular freight service significant fuel savings were realized by using a

semi-automatic throttle control device or "fuel saver" system to take one or more units of the locomotive consist off line when the available power and tractive effort exceeded the demand. This procedure effectively lowered the horsepower per ton ratio of the train and decreased the rate of fuel consumption. For the particular set of operating conditions tested the average fuel savings in percent reached 16.3% at a ruling grade of 0.5%. A prime ingredient for the effective use of such a device was the operating locomotive engineer. For the conditions encountered, testing of the fuel saver did not affect the total test time or the average operating speed. Using the ratio of thousand gross ton miles per gallon (MGTM/GAL) as a barometer of increased fuel efficiency indicated a possible trend toward greater fuel savings when using the throttle control device at increasingly higher operating speeds. For this test series the data results were inconclusive with respect to the correlation between the number of units of the consist in fuel save and the total gallons consumed. As presented in this report, the preliminary results have confirmed the application of the throttle control device as an effective means to reduce fuel consumption in an operating locomotive consist.

The DOT's Transportation Systems Center in Cambridge, Massachusetts, served as support agency for this report.

Jacobs, ME  
Federal Railroad Administration Intrm Rpt. FRA/OR&D-76/297, Dec. 1976, 31 pp, 2 Fig., 7 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

**04 148248  
REGENERATION AND ASSURED RECEPTIVITY IN RAIL  
TRANSIT**

Concern for energy conservation and reduced heat in the subway has caused increased interest in regeneration. However, receptivity of the distribution system to regenerated energy is questionable, leading to consideration of controlled wayside resistors to assure receptivity. The question was studied in terms of train operation, electrical network performance, ventilation and cooling system requirements, and present-worth economic analysis.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Metsch, WW (Parsons, Brinckerhoff, Quade and Douglas, Inc);  
Phelps, DR Sotak, RA Uher, RA Vitt, H  
American Society of Mechanical Engineers Conf Paper Paper D&O-14,  
1976, 21 pp, 15 Ref.

ACKNOWLEDGMENT: EI  
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**04 148250  
INDUCTION MOTOR TRACTION, SUPPLIED BY PWM  
INVERTERS FROM 3,000 VOLT D-C POWER DISTRIBUTION**

The advantages of higher power distribution voltages have long been recognized in electrified railroad operation. The development of power electronic devices, using solid state semiconductor elements has made on-board power conversion preferable. A pulse width modulation (PWM) system permits conversion of d-c to a variable voltage and frequency three phase a-c to supply squirrel cage induction motors for traction. The analysis given in the paper considers the entire power system from a-c input from an

electric power network to the traction motors. It is found that a d-c link is inherent in the PWM induction motor system, and that this link is best provided as the power distribution system from substation to car, rather than on board with a-c distribution.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Holden, WHT Gardner, D, Sr  
American Society of Mechanical Engineers Conf Paper Paper D&O-13,  
1976, 8 pp

ACKNOWLEDGMENT: EI  
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**04 148253  
ENERGY STORAGE PROPULSION SYSTEM FOR ADVANCED  
CONCEPT TRAIN**

The paper describes the propulsion system for the Advanced Concept Train (ACT-1), which is designed to minimize energy consumption of urban rail vehicles by the inclusion of on-board, motor-driven flywhels for recovery and storage of braking energy. This energy source then is used for the next required vehicle acceleration. Minimizing the energy consumption of this type of system requires that the flywheels be sized to absorb all energy recovered from the traction motors during normal vehicle decelerations. In addition, since the recovered energy is processed twice through the traction and flywheel motors, both these devices must be highly efficient.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

McConnell, RW (Garrett Corporation)  
American Society of Mechanical Engineers Conf Paper Paper D&O-38,  
1976, 6 pp

ACKNOWLEDGMENT: EI  
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**04 148305  
THREE-PHASE TRACTION MOTOR FOR D.C. TRAMS  
[Drehstromantrieb fuer Gleichstrombahnen]**

A tram traction motor of squirrel-cage design is described. The motor is supplied by a converter consisting of a d.c. controller and an inverter with phase-sequence suppression. The vehicle has a combined regenerative and dynamic brake system. The transient characteristics of the motor are similar to those of a series-wound traction motor fed through a d.c. controller. [German]

Waidmann, W *Siemens Review* Vol. 50 No. 7, July 1976, pp 493-497

ACKNOWLEDGMENT: EI  
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**04 148306  
TWO-STAGE PRESSURE CHARGING**

Test results of diesel engine performance with two-stage pressure-charging and variable geometry precombustion chamber are discussed.

Gallois, J (SEMT Pielstick) *Railway Engineer* Vol. 1 No. 2, Mar. 1976,  
pp 16-19

ACKNOWLEDGMENT: EI  
ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West  
55th Street, New York, New York, 10019

DOTL JC

05 052939

**COMPOSITION BRAKE BLOCKS. LIMITS OF ENERGY DISSIPATION DURING BRAKING WITH TYRED WHEELS**

A large number of continuous braking tests have been carried out, on the brake test plant of the Laboratory for Vehicle Technology of Delft Technical University, using tyred wheels with both cast iron and composition brake blocks. These tests were commissioned by ORE B 64 and by the CFF. It was hoped by this means to establish a relationship between braking power and the time during which the relevant braking power could be tolerated by the wheel without detriment. The limit laid down was the so called loosening time according to Bodey's temperature criterion (Bibliography reference 1). This limit is the instant at which the tyre begins to loosen on the wheel centre. The loosening time is determined by continuous measurement of the temperatures in the vicinity of the shrink fit surfaces. Knowledge of the relationship between loosening time and brake power, i.e. what may be described as the limit of braking power, permits the greatest possible braking of vehicles to be determined, with the wheels in question, in relation to the axle load and to the route to be run over. The present report contains the most important part of the results of the tests carried out. The three wheels tested, of 900 mm mean diameter with different shrinkage allowances and tyre thicknesses represented a new wheel with maximum shrinkage allowance; a half-worn wheel and a wheel of the smallest permissible tread diameter with minimum shrinkage allowance, that is to say the entire range occurring in practices.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B64/RP 5/E, Oct. 1968, 26 pp, 28 Fig., 4 Tab., 2 App.

ACKNOWLEDGMENT: UIC  
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05 052940

**COMPOSITION BRAKE-BLOCKS. THE DETERMINATION OF CHEMICAL AND PHYSICAL PROPERTIES OF COMPOSITION BRAKE-BLOCKS AND THEIR EFFECT ON THERMAL CRACKING OF TYRES**

The determination of the chemical and physical properties of various composition brake blocks, the measurement of maximum surface temperatures on tyres and the possible damage to tyres caused by various composition brake blocks are dealt with in the report. Investigations which have been made enable the following conclusions to be drawn: Improvement of the braking performance on wet rails requires a content of hard materials of not less than 5%. The material selected shall be harder than the tyre steel (based on Moh's hardness scale). There is no obvious correlation between chemical composition and modulus of elasticity. Brake blocks with a high modulus of elasticity produce high local temperatures and thermal damage. The modulus of elasticity should not therefore exceed 100 daN/mm to the 2nd power. Maximum surface temperatures (hot spots) are influenced principally by peripheral speed at the beginning of braking. The value of axle load also has a pronounced effect, whereas variation in brake block load has in general only a minor effect on the values of the surface temperature. Maximum surface temperatures should not exceed 600 degrees C in order to avoid thermal cracking.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B64/RP 9/E, Apr. 1971, 37 pp, 13 Fig., 3 Tab., 3 App.

ACKNOWLEDGMENT: UIC  
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05 052941

**COMPOSITION BRAKE-BLOCKS**

This final report serves to strike a balance after eight years of work, also showing the progress of the various subsidiary problems at the beginning of 1972. In addition to a brief summary of the work done previously a somewhat more detailed account is given of some new studies (comparative tests on the brake dynamometer, effect of composition brake-blocks on the coefficient of adhesion, chemical and physical changes in the friction surfaces of composition brake-blocks and wheels). The positive side of the bal-

ance-sheet contains numerous data and findings on the brake-blocks, permitting their use though still limited for the time being to obtain benefits regarding economy and braking technique, and as a result of great importance, a proposal for a provisional specification for type acceptance of composition brake-blocks, corresponding to the present state of development. The negative side of the balance-sheet includes the shortcomings and drawbacks still affecting composition brake-blocks; these need to be taken into account as they restrict their application and economic advantages. Those of major importance among the still unsolved problems are the questions connected with the coefficient of adhesion between wheel and rail, metallic inclusions and the effect on the braking efficiency of weather conditions, particularly in the winter. The experts of the railways in the braking field will have to decide, with the aid of the data and findings available, on a given application of composition brake-blocks.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. B64/RP 10/E, Oct. 1972, 131 pp, 56 Fig., 17 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

05 052979

**BRAKE PADS FOR DISC BRAKES. PROVISIONAL SPECIFICATIONS FOR THE ACCEPTANCE OF BRAKE PADS FOR DISC BRAKES**

This report is concerned with the provisional specifications for the acceptance of brake pads for disc brakes, distinguishing two categories of brake pads (H and L). H (high friction) brake pads should have a frictional coefficient of about 0.35, and L (low friction) brake pads one of about 0.25. These specifications of acceptance are essentially based on the conditions which the DB and FS require to be met by brake pads for their vehicles, thus taking into consideration the experience gained so far in the field of disc brakes. The report also contains a summary, listing the vehicles equipped with disc brakes which are now in use on the administrations represented in the B 126 Specialists Committee.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B126/RP 1/E, Apr. 1972, 35 pp, 4 App.

ACKNOWLEDGMENT: UIC  
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05 053003

**ELECTRO-PNEUMATIC BRAKE. BASIC TESTS ON THE TEST-BENCH. TEXT AND APPENDICES**

The first series of tests organised by the DB were carried out on the large test-bench of the Knorr firm at Munich this bench making it possible to simulate different train formations up to 100 vehicles, each equipped with a 12" brake cylinder. These tests have dealt in particular with the two main types of electro-pneumatic brake, namely: electro-pneumatic brake of the automatic type, with 2 brake-pipes electro-pneumatic brake of the direct acting type, with 1 single brake-pipe of 1 1/4" diameter, chosen whilst taking into account the experience already acquired by the Administrations. Thus: for the electro-pneumatic brake of the automatic type with 2 brake-pipes, the tests were carried out in comparison with the pneumatic brake with 1" and 1 1/4" brake-pipe and with the pneumatic brake with 2 brake-pipes, one of which is the feed pipe; for the electro-pneumatic brake of the direct acting type with 1 brake pipe, the diameter of 1 1/4" was chosen having regard to the tests already carried out by the SNCF and the USSR Railways. These types of brakes have been especially examined from the point of view of: exhaustibility, automatic operation, and behaviour in the case of failure of the electro-pneumatic control. The present interim report gives an account of the results obtained during these two series of basic tests on the test-bench. Of course, it will only be possible to draw definitive conclusions after having carried out the envisaged tests on the track.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B83/RP 1/E, Oct. 1964, 29 pp, 43 App.



ACKNOWLEDGMENT: UIC  
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05 053005

**ELECTROPNEUMATIC BRAKE. COST OF FITTING WAGONS WITH THE ELECTROPNEUMATIC BRAKE**

The costs have been estimated for fitting: the automatic type of brake with two brake pipes, and the direct-acting type with one 1 1/4" pipe by the CFF, the DB, the FS and the SNCF. This report contains the results of the studies then carried out by the Committee to ascertain the cost of fitting wagons with the electropneumatic brake. It should be mentioned that the systems are basically the same on all the administrations, but the actual application differs due to the great diversity of equipment used. Because of this, and also owing to the differences in costs, there are certain discrepancies between the estimates.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B83/RP 3/E, Oct. 1968, 9 pp, 10 App.

ACKNOWLEDGMENT: UIC  
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05 053006

**ELECTROPNEUMATIC BRAKE. TECHNICAL AND ECONOMIC STUDY OF THE TWO SYSTEMS OF ELECTROPNEUMATIC BRAKE**

A comparison of: the automatic type of electropneumatic brake with two pipes and the direct-acting type of electropneumatic brake with one 1 1/4" brake pipe has shown that the former is superior from both the technical and the economic standpoint. The technical part of the study involved rack tests and track tests with trains of different compositions. The technical superiority of the automatic type of electropneumatic brake is particularly apparent in the following features: it is inexhaustible and ensures uniform pressure in the brake cylinders of all the vehicles of the train regardless of the manner of brake application; automatic operation is ensured because of the retention of pneumatic control; the brake will still operate even if the electric control system fails (automatic change-over to pneumatic control); if a circuit-checking system is installed it can be done very easily, unlike the direct-acting type of brake for which highly reliable circuit-checking is essential; only with the automatic type of electropneumatic brake is it possible to accept a high proportion of vehicles fitted only with the pneumatic brake. The economic study is based on the principle of fitting all wagons which are to be equipped with the automatic coupler. In addition to the cost of installing the electropneumatic brake equipment on the wagon (see Report B 83/RP 3) allowance has also been made for the cost of equipping the locomotives and for the circuit-checking system, and to this should also be added the cost of modifying the coupling heads of the automatic coupler. The calculations have been made by 4 administrations. Finally, these calculations show clearly that the automatic electropneumatic brake with two pipes is less expensive than the direct-acting type with one 1 1/4" brake pipe.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. B83/RP 4/E, Apr. 1970, 45 pp, 4 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

05 142256

**THE STUDY OF SLIDE CONTROL SYSTEM AT HIGH SPEED RUNNING**

For successful operation of high-speed Shin Kansen trains in regions of heavy snowfall, Japanese National Railways has been investigating methods for improving utilization of available adhesion. An improved wheel slide control system and detector are described. Inconclusive work to date has dealt with a control system which will reestablish adhesion as fast as possible with the smallest decrease in brake force. A new approach would establish available adhesion and limit brakeforce to that limit.

Shirai, S

Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 45-46, 3 Fig.

ACKNOWLEDGMENT: Railway Technical Research Institute

ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

05 142267

**ASSESSMENT OF THE SENF BRAKING SYSTEMS BY COMPARISON. REPORT ON THE BRAKING TEST RIG TESTS AT THE SNCF IN VITRY ON FULL SIZE MODELS [Evaluation par la similitude du système de freinage SENF. Rapport des essais en vraie grandeur au banc des essais de freinage de la SNCF a Vitry]**

Mathematical and experimental study on the SENF electromagnetic brake "without air gap or friction" use in braking high speed trains. This eddy current brake with no air gap, is specifically used on rail vehicles with the TELMA rotary brake. The magnetic circuit consists of a coil winding round the lower part of the wheel, axles and the rail. The authors take stock of the braking tests on the Z7001 rail-car on the track and on the SNCF test rig at Vitry. From the many experimental checks it has been possible to establish accurately to what extent the rail, wheels and coils become heated. [French]

Giovachini, JL Pascal, JP

Institute of Transport Research No. 10, Mar. 1976, 42 pp, 37 Fig., 7 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Institute of Transport Research Avenue du General Malleret-Joinville, Boite Postale 28, 94 Arcueil, France

05 142271

**IMPORTANCE OF SERVICE TRIALS IN THE DEVELOPMENT OF RAILWAY BRAKE BLOCKS**

The development of a railway brake block is seen as a particularly difficult challenge by reason of the many constraints that need to be met. Progress by evolutionary methods is slow, and the risks associated by innovative steps are unwelcomed. A strategy is recommended whereby knowledge is sought from observing anomalous behavior in service, and from conducting an historical comparison of service trials. The recommendation is illustrated by eleven case histories, and although the value of laboratory work is briefly discussed, it is concluded that the best use of nonmetallic railway brake blocks will only result when a more vigorous attempt is made to obtain basic data from observations in service.

Parker, RC (Ferodo Limited) *South African Mechanical Engineer* Vol. 26 No. 2, Feb. 1976, pp 43-52, 17 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

06 053098

**CONTINUOUS MEASUREMENT OF THE SPEED OF WAGONS SHUNTED OVER HUMPS. REPORT OF ENQUIRY**

This enquiry report contains a brief description of the known methods of measuring the speed of wagons in marshalling yards continuously or semi-continuously and a summary of the replies to the questionnaire sent from ORE to all the European Railway Administrations. There are at present only 10 marshalling yards in Europe in which wagon speed is measured and of these five are in Britain. In eight yards the wagon speed is measured by radar and the remaining two use devices placed at intervals in the track. It would appear that both these methods give reasonably accurate and reliable measurements which enable a wagon to leave the retarders at the calculated speed. The measurement of speed at this point in the yard presents no real problem. The problems which present difficulty at present in marshalling yards are the measurement of the other factors which influence the speed of impact of the wagon when it reaches its final siding. Such factors are the rollability, wind, sun, snow and frost. These factors often vary as a wagon is passing through a yard thus increasing the difficulty of accurately assessing them. For these reasons some Administrations are now thinking of the Dowty system, which although more expensive to install will control the speed of wagons without the necessity of measuring all the above variables. It is therefore suggested that the study of the present question should be incorporated in a new question entitled: "The control of wagon speed in modern marshalling yards".

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D74/RP 1/E, Apr. 1963, 22 pp, 9 Fig., 9 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

06 053099

**CONTINUOUS MEASUREMENT AND CONTROL OF THE SPEED OF WAGONS SHUNTED OVER HUMPS. COMPLEMENTARY REPORT OF ENQUIRY**

The classical automatic marshalling yard with retarders, weigh rails, wagon rollability measurement, doppler radar speed measurement computers, etc. is described and the results of this type of yard are examined. The reasons why the results fall short of what is required are explained and the report then goes on to describe five new systems which are being developed at present in Europe. The first of these is the automatic rope conveyor system being developed by the DB in which no hump or shunting locomotive is required as the movement on wagons is achieved by transporters which are mounted at the side of the track and push the wagons along from the reception sidings to the sorting sidings at controlled speed. The second system uses an electrodynamic brake and a linear motor accelerator at the beginning of each sorting siding to control the speed of entering wagons. It is being developed by the CFF in their Basel marshalling yard. The third system uses a chain of small retarders in each sorting siding which brake wagons as they pass if their speed is too high. The fourth method is the Dowty system in which the wagon wheel strikes the pistons of a series of cylinders which sense its speed and either push it forward or retard it. This system is being developed by BR. The fifth method is the Saxby system which incorporates a retarder at the end of each sorting siding with a rollability and distance to run measuring devices which feed a computer which releases the retarder when the wagon has sufficient speed to reach the rake of standing wagons. This system is being tried out by the SNCF at Vaires marshalling yard near Paris. These systems are all in the development stage and as yet not all the figures for the installation and maintenance costs are available. It is suggested that an Expert Committee be set up to study these questions and to look more fully into the question of the speed control of wagons in marshalling yards.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. D 74/RP 2/E, Mar. 1964, 35 pp, 30 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

06 053100

**CONTINUOUS MEASUREMENT AND CONTROL OF THE SPEED OF WAGONS SHUNTED OVER HUMPS. THE POTENTIAL CAPACITY OF VARIOUS TYPES OF AUTOMATIC HUMMING SYSTEM**

The capacities of the following systems are investigated: a) the system of the DB with primary and sorting-siding retarders followed by chains of retarders or rope conveyors (target-speed braking); b) the system of the CFF with primary and sorting-siding retarders followed by chains of retarders and rope conveyors (target-speed braking); c) the system of the SNCF with primary and sorting-siding retarders (target braking); d) the system of BR: Automatic Hump Yard with continuous control of the wagons by means of hydraulic retarder and booster units (BR Dowty). The system of the DB for eight sorting-sidings has been operated in Duisburg-Wedau Marshalling Yard as an experimental installation since 1967. The CFF and FS are testing different items of the equipment for automatic hump yards. The system of the SNCF for eight sorting-sidings has been tested in Vaires Marshalling Yard since 1967. The system of BR has been fully operational in Tinsley Yard since 1965 and in Bescot Yard since 1966. Basic calculation data of the CFF and BR systems differ from the standard data of the investigation in some respects, and the possibility of comparing them with other systems is therefore limited. All the systems considered have a high capacity. The system of BR appears to provide maximum protection of wagon and load. Each system is considered operationally suitable.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D74/RP 4/E, Apr. 1969, 45 pp, 6 Fig., 3 Tab., 17 Ref.

ACKNOWLEDGMENT: UIC  
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06 130034

**RULES FOR THE PROTECTION OF WIRE COMMUNICATION SYSTEMS FROM THE INFLUENCE OF AC TRACTION LINES**

[Pravila zashchity ustroystv provodnoi svyazi i provodnogo veshchaniia ot vliianiia tiagovoi seti elektricheskikh zheleznykh dorog peremennogo toka]

Ten years have passed since the publication of the "Temporary rules" and during this period the alternating current electrified railroad system has surpassed 10,000 km. In the processes of planning, construction and operation of the alternating current electrified railroad, experience has accumulated, propositions for decreasing expenditures for the protection of communication systems have taken root, theoretical and experimental research on the influence of traction currents has deepened, and norms for dangerous and interfering tensions and currents have become more exact. All this has led to the necessity for reworking and correcting the active temporary rules. This edition of the rules includes discussion on the following topics: definition of rules; areas of application; basic concepts and definitions; norms for dangerous currents and tensions, requirements for electrical traction arrangement, indications regarding expenditure and expense formulas; dangerous currents and tensions during magnetic, electrical, and galvanic influence; dangerous tensions in communication networks with remote control feeding of amplifiers; interfering magnetic influence on tonal frequency telephone circuits; finally, interfering influence on wire communication circuits. The appendices include: protective action factor of cable covers: symmetry of cable circuits; basic indications for the definition of protective action of suction transformers, mutual induction between single-conductance circuits, toward the calculation of dangerous magnetic influence in the communication lines, screening constant of rail action, dissemination ratios of single-conductance cable and aerial circuits, calculation of galvanic influence, calculation of interference of the traction network on the tonal frequency network, frequency-characteristics of the sensitivity factor of double conductance communication circuits and wire communication; finally, the allowable voltages in adjacent lines of automatic telephone exchanges during galvanic mode of transmission of controlling impulses. [Russian]

Abstract only is available in English, Original untranslated as of November 1976.

USSR Ministry of Railways, USSR Ministry of Communications 1973, 96 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

06 130048

**NEW DEVELOPMENTS IN THE FIELD OF PROTECTION OF COMMUNICATION, SIGNALING, CENTRALIZING AND BLOCKING DEVICE ARRANGEMENTS ON ELECTRIFIED ROADS** [Novoe v oblasti zashchity ustroystv svyazi i signalizatsiia, tsentralizatsiia, i blokirovka na elektrifitsirovannykh dorogakh]

This pamphlet covers new developments in the field of protection of communication, signaling, centralizing, and blocking devices on electrified railroads. There are six project descriptions. (1) Methods of calculating interference currents in conductance circuits on alternating current electric traction road sections, covering the basic conditions and formulas for determining the current. (2) Telephone cable circuit sensitivity factor, covering the results of research into sensitivity to external electromagnetic influences. On the basis of analysis of the influencing factors, recommendations are made for normalization, and measurement methods are given for parameters of external influence; also covered are problems of asymmetrical influence of intermediary point apparatus on the telephone cable sensitivity factor. (3) Requirements for protective action and opposition to grounding of main communication cable casing and armor on alternating current factors. (4) Protective action of suction transformers against the interfering influence of the tractive network upon the communication circuit, including a calculation method and experimental results. (5) New rules of conductance communication mechanism protection from direct current electrified road tractive circuit influence, including a new calculation method for influences upon aerial communication cables and corrected norms for audio frequency conductance cable interference tensions. (6) Research into the effectiveness of protection schemata against instrument overloading of 50 Hz. alternating current code track circuits with throttle transformers, including experimental research results carried out on type RVN-250 low voltage valve dischargers and selenium voltage arresting devices. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 474, 1972, 88 pp, 56 Fig., 9 Tab., 14 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

06 130054

**25 HERTZ PHASE-SENSITIVE TRACK CIRCUITS** [Fazochuvstvitel'nye rel'sovye tsepi 25 GTs]

This book describes 25 Hz. phase-sensitive track circuits; they have been employed more and more within the past several years in connection with the electrification of railroads on alternating current. Problems in the development of schemata, definition of parameters, and choice of feeding of these rail circuits are scrutinized. The book is intended for technical engineering workers of railroad transport who are connected with the construction, planning, and operation of rail circuits; it may also be utilized by students of the higher educational institutions for the fulfillment of course and diploma work. The book's chapters are: (1) Interferences created by alternating current electrical traction in track circuits; (2) Track circuits during alternating current electrical traction and their protection from interferences; (3) Parametrical frequency divisors in 25 Hz. track current feeding systems; (4) 25 Hz. phase-sensitive rail circuit two phase feeding system; (5) 25 Hz. track circuits with phase-sensitive road relay for stations with alternating current electrical traction and junction stations. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Transport Publishing House 1972, 95 pp, 42 Fig., 19 Tab., 17 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

06 130060

**HANDBOOK FOR SIGNALING ON SOVIET RAILROADS**

[Instruktsiia po signalizatsii na zheleznnykh dorogakh soiuza S.S.R.]

This book establishes a system of visual and acoustical signals for the transmission of orders and directions related to the movement of trains and

maneuvering operations, as well as the types of signaling assemblies promoting their usage. The exact and implicit observance of signals insures the steady and safe movement of trains and operational maneuvering. The book is imperative for all rail transport subdivisions and workers, and may be replaced only by order of the Ministry of Railroads. All instructions and other indicational directions relative to the signaling on railroads must critically correspond to the requirements of this instruction book. The contents include, under the chapter heading "Permanent Signals", the following sections: visual and acoustical signals; signal lights; entry and exit lights; itinerary and access signal lights; semaphores; narrow access signal; torpedo additions to entry and access semaphores; defective signal light barriers; permanent discs for lowering speed; designation of ineffective signals. "Portable Signals" covers: delineation of work production on shunts; stations; limiting rolling stock to station paths. "Signal Directions and Signs" covers: itinerary; switch; road obstruction; hydraulic column, and "Lower current collector!" signals; permanent and temporary signals. "Train Signals" covers: during train movement; during movement of snow cleaners; during movement of the remote control trolleys and maintenance towers; road wagons, and other rolling stock. Finally, there is a small section on "Alarm signals and special indicators". [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Transport Publishing House 1971, 183 pp, 195 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

06 130238

**HANDBOOK FOR SIGNALLING ON SOVIET RAILROADS**

[Instruktsiia po signalizatsii na zheleznnykh dorogakh Soiuza SSR]

This signaling handbook contains information on the following topics: (1) Signals: visual and auditory; (2) Permanent signals: traffic lights, invitational lights, exit and entry lights, itinerary lights, passage lights, precautionary and repetitive lights, locomotive lights, semaphores with petards, enclosure of non-accurate semaphore and traffic lights, permanent discs for lowering speed, designation of non-functioning signals; (3) Transportable signals, guarding of places of obstruction for train traffic and places of work production on the railroad runs, enclosure of difficult places for train traffic and work production spots at the stations, limitation of rolling stock on the station tracks; (5) Signal indicators and signs; (6) Itinerary indicators, arrow indicators, indicators of track obstruction, of hydraulic columns, "Lower current collector" indicators, permanent signal signs, temporary signal signs; (6) Signals employed during switching operation, switching traffic lights, hand and audio signals for switching; (7) Train signals during train traffic, snow-cleaner traffic, signals on locomotives during switching transfers, signals during traffic of detachable railway motor cars, repair garrets, track trolleys, and other such rolling units; (8) Auditory signals; finally; (9) Alarm signals and special indicators. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1972, 183 pp, 198 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

06 133024

**HIGH VOLTAGE AC POWER TRANSMISSION LINES AND COMMUNICATIONS RECEIVER SITES**

A short discussion of the effects of the Electromagnetic Interference (EMI) radiated from High Voltage AC (HVAC) Power Transmission lines on HF Communications Receivers is followed by the description of a method for choosing communications receiver sites to minimize interference from these transmission lines.

Hill, FR

United States Coast Guard Tech Rpt.7 EEE-TR-1, 1960, 33 pp

ACKNOWLEDGMENT: NTIS

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AD-A022986/4ST, DOTL NTIS

06 133102

**REFLECTIVITY INSTRUMENTATION DESIGN**

A reflectometer has been constructed and used during both daylight and night hours to make field reflectivity measurement of highway signs. The reflectometer operation was made independent of ambient light by using a mechanical chopper to modulate an internal light beam, which is directed toward a sign. A human eye corrected light sensor collects the modulated light reflected from a two degree spot on the sign, and the receiver measures the average value of resulting amplified A.C. voltage component. This represents relative reflectance. This report discusses the design considerations, and alternate approaches considered, the prototype and the final instrument. Field measurements are discussed, and possible uses of this and similar instruments are briefly commented on.

Prepared in cooperation with Louisiana Dept. of Highways, Baton Rouge.

Williams, T

Louisiana Tech University, Federal Highway Administration, Louisiana Department of Highways, (HPR) Final Rpt. Dec. 1974, 76 PP

ACKNOWLEDGMENT: NTIS, Federal Highway Administration

ORDER FROM: NTIS NTIS Price, /MF\$2.25

PB-250964/4ST, DOTL NITS

06 133290

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. SIGNALS AND COMMUNICATION**

The main purpose of signaling is to provide safety and headway for rapid transit operations. This is accomplished by installing and interconnecting thousands of components of signal equipment into a coordinated system that, in all phases, stresses safety. There are three (3) main classifications of signals: automatic signals, approach signals and home signals. The purpose of the manual is to assist in standardizing the procedures involved in furnishing and installing of equipment to establish a signal system.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PC\$70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-5, Mar. 1975, 245 pp

ACKNOWLEDGMENT: NTIS

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PB-251646/6ST, DOTL NTIS

06 136408

**SAFETY AND AUTOMATIC TRAIN CONTROL FOR RAIL RAPID TRANSIT SYSTEMS**

The paper partially summarizes a Department of Transportation study. The study describes the state-of-the-art in rail rapid transit system automatic train control, assesses the safety-related interrelations between the train control system, functions of the human operator and other portions of the total system, and makes recommendations, based on current experience, to aid the process of planning, funding approval, design, implementation, test, safety certification and operation of new systems or modifications of existing systems.

Presented at the Am Transit Assoc Rail Transit Conf., San Francisco, Calif., Apr. 14 and 16, 1974, Power and Signals Sess. NTIS Nos. PB-234 824; PB-234 825 and PB-234 826.

Pastor, GJ (Transportation Systems Center)

American Transit Association ATA/RT-74/1,2,3, 1974, pp 1-11

ACKNOWLEDGMENT: EI

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06 136412

**ENVIRONMENTAL IMPACT ON ELECTRONIC EQUIPMENT**

The paper discusses problems faced by BART maintenance staff caused by the San Francisco Bay Area environment. The areas covered are the effect of heat on the wayside train control, the gophers eating buried control cables, moisture and dirt contamination of the destination signs and electrical noise of the destination signs and electrical noise of the communication cables.

Presented at the Am Transit Assoc Rail Transit Conf, San Francisco, Calif., Apr. 14 and 16, 1974, Power and Signals Sess. NTIS Nos. PB-234

824; PB-234 825 and PB-234 825.

Engle, CH (Bay Area Rapid Transit District)

American Transit Association ATA/RT-74/1,2,3, 1974, pp 12-25

ACKNOWLEDGMENT: EI

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06 136571

**BACKUP SYSTEM TO BART AUTOMATIC TRAIN CONTROL SYSTEM LEADING TO TRANSBAY CROSSING. PROGRESS REPORT, MARCH 1974**

A program was begun to: (1) investigate problems of the Bay Area Rapid Transit District (BART) Automatic Train Control (ATC) system; (2) evaluate tentative corrective strategies; and (3) provide technical evaluations of other system matters. BART ATC problem areas include train detection and collision avoidance resulting from lost occupancy indications. Corrective measures, referred to as the Backup System, were developed to add additional memory capability to the ATC for the last detected position of all trains. Additional efforts are being made to measure the performance of the ATC and to evaluate the logic equations and the traffic-simulation programs.

Scalise, DT Evans, DM

California University, Berkeley Mar. 1974, 26 pp

ACKNOWLEDGMENT: NTIS

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UCID-3771, DOTL NTIS

06 138063

**AUTOMATIC TRAIN CONTROL IN RAIL RAPID TRANSIT**

The extent to which various levels of automation are technically feasible, economically justifiable and otherwise appropriate for use on Federally-supported rail rapid transit systems is examined. Considered are substitution of automatic mechanisms for human performance of major train control functions. Various combinations of train control systems are surveyed in terms of safety, performance and cost. In addition to this state-of-the-art appraisal, testing methods used to evaluate such systems and the planning process involved in reaching decisions about their use are assessed. Costs and benefits of automated control technologies are being examined more carefully as a result of the automation experiences of the Bay Area Rapid Transit System. Emphasis has been on development of advanced technology at the expense of pressing short-term needs for refining and improving present technologies.

United States Congress May 1976, 238 pp, 69 Fig., 34 Tab.

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO 052-070-03479-3, DOTL RP

06 138362

**AN ECONOMIC ANALYSIS OF TRAIN CONTROL**

This report represents the completion of project which deals with the economics of rapid transit train control. Information dealing with rapid transit control systems from all parts of the world is used for the development of a computer program to analyze costs of an automatic vs. manual train control system. The Train Control Analysis Program (TCAP) utilizes actual data from a rapid transit operator. This data can be from an existing manual system which is considering automation, or it may be a system in the planning phases, which is trying to determine the proper transit control to utilize. Once the data has been entered through the computer terminal keyboard, an analysis is made. The program operates in a time sharing mode so that it is very convenient to change certain input parameters and observe the corresponding analysis immediately. This program can be used to determine what the above benefits may cost in relation to a less sophisticated system. The results of this analysis may be used in the decision making process of selecting an adequate control system.

Sponsoring agency is UMTA, DOT.

Goldstein, L

Polytechnic Institute of New York, (UMTA-74-11-2) Res. Rpt. UMTA-NY-11-0009-74-3, May 1974, 187 pp

Contract NY-11-0009

ACKNOWLEDGMENT: UMTA, NTIS  
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PB-254226/4ST, DOTL NTIS

06 139459

**OPTICAL AUTOMATIC CAR IDENTIFICATION (OACI). FIELD TEST PROGRAM**

The results of the Optical Automatic Car Identification (OACI) tests at Chicago conducted from August 16 to September 4, 1975 are presented. The main purpose of this test was to determine the suitability of optics as a principle of operation for an automatic car identification. Readabilities by standard and "modified" scanners were measured. Based on the optical information available in the label-scanner communication channel and the determination of the non-read causes, the label-scanner readability and limit of readability were obtained. Also the same readabilities were obtained using multiplexed data from two scanners, one at each side of the track. The benefits of redundancy in the multiplexed data are based on the analysis of the test results. Conclusions and recommendations are presented. No attempt has been made to evaluate the hardware implementation of the OACI systems used during the Chicago test.

Sponsored by Federal Railroad Administration, U.S. DOT.

Ingrao, HC

Transportation Systems Center, (DOT-TSC-FRA-76-9) Final Rpt. FRA-ORD-76/249, May 1976, 186 pp, Figs., Tabs.

ACKNOWLEDGMENT: FRA, NTIS  
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PB-254810/5ST, DOTL NTIS

06 139478

**ON THE THEORY OF SYSTEMS FOR THE AUTOMATIC SPEED REGULATION OF FUTURE ELECTRIC TRAINSETS [Zur Theorie der Systeme fuer die automatische Geschwindigkeitsregelung zukunftiger Elektrotriebzuge]**

The authors explain a method for analysing the transition processes by introducing a series of simplifications. Based on this analysis, the authors propose a procedure for the calculation of identical automatic systems. The results of the theoretical calculations have been confirmed by tests. [German]

Feoktistov, VP Tschauow, OG *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 22 No. 2, 1975, pp 301-310, 7 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List Friedrich List Platz 1, Dresden 801, East Germany

06 139479

**A NEW NON-CONTINUOUS MICRO-WAVE TRANSMISSION SYSTEM FOR THE RAILWAY [Ein neues punktformiges Mikrowellen Uebertragungssystem fuer Eisenbahn]**

The authors begin by comparing the possible working methods and available frequency bands for a non-continuous, high-capacity transmission system for exchange of information between the vehicle and the ground. They then discuss the selection criteria which led to the development of the SI-CARD-TCL micro-wave system. A technical description of this system is given at the end of this study. [German]

Isensee, A Steinkamp, J *Eisenbahntechnische Rundschau* Vol. 25 No. 3, Mar. 1976, pp 171-180, 4 Fig., 1 Tab., 5 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

06 139494

**THYRISTOR CHOPPER CONTROL AND THE INTRODUCTION OF HARMONIC CURRENTS INTO TRACK CIRCUITS**

Covers the practical measurements made by London Transport on the levels of induced current in track circuits produced by conventional and thyristor-(chopper-) type traction equipment on their 4th-rail traction supply system. The method of measurement, the subsequent method of analysis and the implications of the results are described and discussed.

Duck, EW *Institution of Electrical Engineers, Proceedings* Vol. 123 No. 6, June 1976, 8 pp, 23 Fig.

ACKNOWLEDGMENT: UIC

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06 139501

**VOICE COMMUNICATION IN THE TUBE**

London Transport's small-bore tube tunnels represent a hostile environment in which to establish a speech link with moving trains. Deficiencies in the carrier wave system introduced on the Victoria line in 1968 led to experiments with multi-base stations and balanced leaky-feeder cables on the Bakerloo, but coaxial feeders with one-way repeaters are giving better results on the Northern line.

Alexander, LM *Railway Gazette International* Vol. 133 No. 4, Apr. 1976, pp 129-132

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

06 139533

**SINGLE TRACK RAILWAY SIMULATION: NEW MODELS AND OLD**

The capacity of a single track railway line can be increased in a number of ways. A rational choice between these different ways is best made with the help of a computer. The article outlines the different models developed by the Australian Railways to solve these problems.

Rudd, DA Storry, AJ *Rail International* Vol. 7 No. 6, June 1976, pp 335-342, 3 Fig., 5 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

06 139938

**AUTOMATIC TRAIN CONTROL IN RAIL RAPID TRANSIT**

The history of train control technology has seen extensive, but not complete, replacement of the human operator by machines. The increasing reliance on automation, both on existing transit systems and those under development, raises several basic issues about this application of technology. Questions about the safety, operational advantages, cost effectiveness and institutional factors associated with automation were raised by the Transportation Subcommittee of the Senate Committee on Appropriations in conjunction with federally supported rail rapid transit projects. This report deals with the degree of automation which is technically feasible, economically justifiable, or otherwise appropriate for rail rapid transit. Divergent opinions are included and, where the subject matter is controversial, an attempt has been made to present a balanced treatment.

United States Congress May 1976, 238 pp, Figs., Tabs.

ACKNOWLEDGMENT: United States Congress, NTIS

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402 NTIS

GPO-052-070-03479-3, DOTL RP, PB-254738, DOTL NTIS

06 139945

**HOT BOX DETECTOR DATA ANALYZER SYSTEM**

Because of inconsistencies in manual analysis of the tape readouts from hot box detectors, Canadian National has been developing a computerized analytical system. Reasons for automated analysis and the benefits from such data evaluation are listed. A minicomputer is utilized for the routine processing of HBD data received in digital form. Because the system is developmental, the quality of its output is not listed.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976.

Friesen, W (Canadian National Railways)

American Railway Engineering Association Proceeding Vol. 77 Bulletin 658, 1976, pp 521-525

ORDER FROM: ESL

DOTL JC

06 141104

**AUTOMATIC CAR IDENTIFICATION (ACI): THE KEY TO BETTER CAR UTILIZATION**

Railroads have invested heavily in new cars, modern terminals, large computer main frames, and sophisticated materials handling equipment. But car utilization/mileage has not improved significantly. The paper looks at railroads hauling coal and how they might gear up to handle the forecasted increases in volume. The proposed ACI system integrated into a node (regional) concept of car management, is presented as the logical solution. Economic justification is also presented.

Technical paper presented at meeting of Society of Manufacturing Engineers in Cleveland, Ohio, September 23-25, 1975.

Collins, DJ (Computer Identics Corporation)

Society of Manufacturing Engineers Proc Paper MS75-647, Sept. 1975, 10 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Society of Manufacturing Engineers 20501 Ford Road, Dearborn, Michigan, 48128

06 141127

**A COMMUNICATIONS SYSTEM FOR LONG TRAINS**

Transmission lines have not been used as communications links on long freight trains for lack of a suitable inter-car connector. Metal-to-metal contacts have not been dependable in the harsh railway environment. In this project radiative, inductive and capacitive connectors were studied. Only the inductive coupler appeared to offer a practical solution to the problem. A tuned inductive coupler was developed with the following specifications: transmission coefficient 0.7, bandwidth 20 kHz, centre frequency 100 kHz, power dissipation 3 watts. The mechanical arrangement for holding the two windings of the coupler in contact employs the same principle as the "clad-hand" coupler used in the airpressure system. Thus, the electrical contact is made through magnetic fields and the mechanical aspects employ proven railway practice. It is recommended that a set of prototype couplers be field tested.

Aitken, GJM

Canadian Institute of Guided Ground Transport, (CIGGT Project N.1. 1) Final Rpt. CIGGT Rept. N.75-4, Feb. 1975, 75 pp, Figs., Tabs., 2 Phot., 8 Ref., 5 App.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

06 141138

**SOLID STATE BI-DIRECTIONAL MICROWAVE REPEATER FOR GUIDED RADAR OBSTACLE DETECTION IN GROUND TRANSPORTATION**

The design and fabrication of a bi-directional microwave repeater amplifier incorporating two single stage microwave transistor amplifiers (at 1 GHz) is presented in this work. Limitations of the repeater due to mismatches at the input and output ports are described. Circuits similar to Echo Suppressors and Echo Cancellers used in two-wire telephone systems are suggested for the reduction of the effects of mismatches at the two ports of the repeater.

Gupta, MS Tan, HH

Canadian Institute of Guided Ground Transport No. 73-6, No Date, 86 pp, Figs., 20 Ref.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

06 141423

**BASIC TRACK CIRCUIT LIMITATIONS**

The conventional steady energy DC track circuit, the coded track, single-and double-element AC, the single-rail, double-rail and jointless track circuits are discussed in terms of their variables and the basic limitations of 0.06 ohm shunting sensitivity and broken-rail protection. Source voltage, track relays, ballast resistance and rail impedance are explained for each case.

Carey, AJ

Westinghouse Air Brake Company Tech. Rpt. Bull. N. 261, No Date, 18 pp, 12 Fig.

118

ORDER FROM: Westinghouse Air Brake Company Union Switch and Signal Division, Swissvale, Pennsylvania, 15218

DOTL RP

06 141424

**COMPUTERS IN RAILROAD CONTROL: 1965, 1975, 1985**

Computer applications on railroads can be grouped into two general categories: information processing and process control. By 1964, 44 railroads had installed about 140 computers, almost none performing process control tasks. By 1975, 90 railroads had 290 computer installations of which 175 were minicomputers with about 100 used in process control applications. In the decade, minicomputers had found a wide range of applications from hump yard control to track recording car measurements. This paper discusses hump yard control, centralized traffic control (CTC), automatic car identification, track geometry measurement and less frequent applications of minicomputers including engine analysis, training simulators, flat-yard inventory and automation, hot box signal analysis and car dumping. It is estimated that there will be 500 minicomputers on railroads by 1985.

Presented at an Association of American Railroads, Data Systems Division, Conference.

Cole, NM

Westinghouse Air Brake Company Conf Paper Bull. N. 302, No Date, 18 pp, 5 Fig.

ORDER FROM: Westinghouse Air Brake Company Union Switch and Signal Division, Swissvale, Pennsylvania, 15218

DOTL RP

06 141425

**EVOLUTION OF AUTOMATIC CONTROLS IN THE CLASSIFICATION TERMINAL AREA**

The automatic control systems associated with classification yards are performing both process control and management information functions to provide for the functioning of yard operations hardware and to manipulate data into report format. From the 15 yards equipped with digital computers, it is anticipated that there will be both new installations and an extensive updating of older automatic, manual and analog-computer controlled yards. Each will require systems engineering with a high degree of sophistication.

Presented at the IEEE Convention in New York City, March 21, 1972.

De Ivernois, PJ

Westinghouse Air Brake Company Conf Paper Bull. N. 282, Mar. 1972, 20 pp, 15 Fig.

ORDER FROM: Westinghouse Air Brake Company Union Switch and Signal Division, Swissvale, Pennsylvania, 15218

DOTL RP

06 141426

**RAILROAD FREIGHT CAR CLASSIFICATION YARDS: INSTALLATIONS 1924-1976**

Mechanized classification yards have undergone many design and operating changes since their introduction in 1924. This report is a tabulation of all railroad freight classification yard installations in the U.S. and Canada. Information shows year placed in service, railroad, yard name and location, major equipment supplier, number of tracks and type of control. Also included is hardware configuration, use of computers, peripheral equipment and other data of interest.

Westinghouse Air Brake Company Bull. No. 300, 1976, 42 pp, Tabs.

ORDER FROM: Westinghouse Air Brake Company Union Switch and Signal Division, Swissvale, Pennsylvania, 15218

DOTL RP

06 141428

**TRACK CIRCUIT CHARACTERISTICS ASSOCIATED WITH MOTION MONITORING**

Motion monitoring devices have been developed to provide warning activation at grade crossings by signaling the actual approach of a train because conventional crossing protection systems are unable to differentiate between a stopped and moving train. The motion monitor detects the rate of change of track impedance to indicate train movement. In the design, the frequency ballast, distance to train and terminating shunts and their effect

on the motion sensing equipment must be considered. Problems can be encountered with broken rail protection.

Presented to the Committee "D" Workshop, Association of American Railroads, Communications and Signal Section, at the 1975 Annual Meeting, New Orleans, Louisiana.

Blazek, FV  
Westinghouse Air Brake Company Conf Paper Bull. N. 310, Oct. 1975, 12 pp, 11 Fig.

ORDER FROM: Westinghouse Air Brake Company Union Switch and Signal Division, Swissvale, Pennsylvania, 15218

DOTL RP

**06 141439**  
**SURVEYING WORK ON LINE SECTIONS FOR RADIO TRAIN CONTROL [Streckenvermessung für den Zugbahnfunk]**

The purpose of the radio system is to link train drivers and ground operating control centers for the transmission of radio messages. This radio link is ensured by transmission and receiving equipment installed at the trackside and on the motive units. The surveying work required to determine the installation positions is carried out by the Munich test laboratory and a surveying team from the firm of AEG-Telefunken, using a specially designed measuring system. The authors describe the problems of radio wave propagation, and measuring methods and results. [German]

Angrabeit, F Ostermeyer, M *Signal und Draht* Vol. 68 No. 5, May 1976, pp 98-103, 2 Fig., 2 Tab., 5 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Dr Arthur Tetzlaff-Verlag Niddastrasse 64, Frankfurt am Main, West Germany

**06 141453**  
**RELIABILITY OF SIGNALLING TECHNIQUES [Zuverlässigkeit der Signaltechnik]**

To date checks and analyses into the faulty working of safety and signalling devices have been carried out manually involving lengthy statistical work. The author describes a method he has developed using a computer. This method has already been tested in certain sectors and with it the reliability of signalling and safety equipment can be monitored automatically and major characteristic practical values obtained as regards reliability. [German]

Wehner, L *Signal und Draht* Vol. 68 No. 3, Mar. 1976, pp 39-47, 4 Tab., 30 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Dr Arthur Tetzlaff-Verlag Niddastrasse 64, Frankfurt am Main, West Germany

**06 142249**  
**PREVENTION OF RAT DAMAGE TO RUBBER AND PLASTIC INSULATED CABLES WITH USE OF REPELLENTS**

Rat damage to railway signal and communication cables is increasing and some method of protection is necessary. No rat repellents have been used. In developing an effective repellent against rats for plastic and rubber insulated cables, several indoor and outdoor tests were conducted. Results indicated the most effective material and methods of application.

Yagi, S Yamano, K  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 18-20, 3 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

**06 142255**  
**OVER-IMBALANCED WHEEL LOAD MEASURING SYSTEM IN MUSASHINO YARD**

Since the Tsurumi Accident in 1963 imbalanced wheel load has been counted as one of the causes of interactional derailment, hence main yards are presently equipped with the devices for measuring of over-imbalanced wheel load of cars. The device aims at detecting over-load and one-sided weight of a freight car by measuring the wheel weight per car of a running train

which arrives at a yard. By the conventional device, fitted with load-cells under the short rail, the passing speed of a car is limited within 25 km/h. In order to improve the measuring speed, a method for measuring of shearing strain on the rail due to wheels by bonding a rectangular strain gauge to the rail web was applied to the over-imbalanced load measuring system. This method, developed by R.T.R.I., is for measuring of shearing strain on the rail with little influence of adjacent wheels. The device is to be installed in Musashino Yard in anticipation of improving the precision of measurement of trains passing at a speed of 45 km/h by adopting multi-point (5-point) measurement system with proper gauge intervals. This report describes the construction and the test results of the subject device.

Nakumara, M Shioya, A Wada, K Shimada, S  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 43-44, 3 Fig., 3 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

**06 142260**  
**RELIABILITY OF MICROWAVE COMMUNICATION SYSTEMS**

This paper describes the reliability of microwave communication systems. Individual considerations are given to equipment reliability, propagation reliability and system reliability. The reliability model of the microwave communication system was established. Applying the field data to this model, the reliability of the route of the second microwave links was predicted and data were obtained for actual system design.

Sakata, T Saito, M Fujita, T  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 2, 1976, pp 64-67, 3 Fig., 4 Tab., 3 Ref.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

**06 142261**  
**DATA TRANSMISSION ON TIME-DIVISION-MULTIPLEXED RADIO CHANNELS**

For a communication system where a large number of mobile stations communicate with a fixed station, each for a brief interval, a method of "time division multiplexing" using a pair of radio frequencies is effective. Such communication can be achieved using standardized single-channel radio transceivers and sub-carrier modulator-demodulator sets. Transmissions in which 60 bits of information were exchanged were conducted at intervals of less than 100 ms through the time-divided mobile radio channels with experimental equipment.

Matsumura, K  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 2, 1976, pp 68-72, 4 Fig., 2 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

**06 142275**  
**PRINCIPLES FOR THE DESIGN OF CIRCUITS FOR SIGNAL BOXES OPERATED BY MEANS OF STATIC-ELEMENT MODULES [Principy postrojení shem elektrické centralizace na ferrit-tranzistorových moduljeh]**

The "Railway Telecontrol and Automation" centre run by the Leningrad Railway Engineering Academy has developed an electronic signalling system operated by means of ferrite modules and transistors with coding of information by out-of-phase impulses. The present article examines the working of this system. [Russian]

Pereborov, AS *Avtomatika, Telemekhanika I Svyaz* Vol. 20 No. 5, 1976, pp 5-8, 3 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL



06 142279

**COLOR-LIGHT AUTOMATIC BLOCK FOR TRACK CIRCUITS WITHOUT INSULATING JOINTS [Automatischer Streckenblock mit isolierstosslosen Gleisstromkreisen]**  
No Abstract. [German]

Poupe, O *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 22 No. 4/5, 1975, pp 1029-35

ACKNOWLEDGMENT: UIC

ORDER FROM: Hochschule fuer Verkehrswesen — Friedrich List — Friedrich List Platz 1, Dresden 801, East Germany

06 142282

**APPLICATION OF THYRISTOR CONTROL TO RAIL TRACTION. IMPACT UPON THE SIGNALLING EQUIPMENT: DISTURBANCES NOTICES AND STEPS TAKEN TO REMEDY THEM [Utilisation de la commande par thyristors en traction ferroviaire. Repercussions sur les installations de signalisation: perturbations constatees et dispositions adoptees pour y remedier]**

After recalling that the use of thyristors ensures simultaneous rectification of the traction current and voltage regulation accompanied, however, by the appearance of harmonics, the article introduces the notion of the "equivalent disturbing current" and sums up the results of tests carried out with single phase and dc driving motors. The effect of thyristor control on the signaling system is considered. Different track circuits used by the S.N.C.F. and the terms of coexistence of the latter with thyristorized machines with the appropriate possibilities of disturbance are studied. The experimental results obtained are presented and concrete solutions which have been adopted are described. Also, radio disturbances are discussed. [French]

Kieffer, A (French National Railways); Grangeon, R *Revue Generale de l'Electricite* Vol. 85 No. 4, Apr. 1976, pp 295-303

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

06 144081

**ATC HELPS LAMCO MOVE INCREASING TRAFFIC**

Controlling 12,000-ton trains of iron over the Lamco Railroad's undulating 267-km line in Liberia requires a high degree of precision to assure safety. With the possibility of annual movements exceeding the current 13.5 million tons, it was decided that safety and operating flexibility could be improved by supplementing the existing CTC with automatic train control. Integra's ISR72 system provides speed supervision and passing sidings and on open line where permanent or temporary speed restrictions are in force.

Koenen, BHN *Railway Gazette International* Vol. 132 No. 10, Oct. 1976, pp 373-75, 1 Tab.

ORDER FROM: ESL

DOTL JC

06 147573

**STANDBY POWER FOR RAILROAD-HIGHWAY GRADE CROSSING WARNING-SYSTEMS**

The requirements for standby power at railroad-highway grade crossings, as established by the states, the Association of American Railroads, and the individual railroads, are described. Standard means of satisfying these requirements, using 115 vac primary power and storage batteries for standby, are compared with a number of new techniques, now passing from experimental to operational use, that incorporate solar cells or thermoelectric generators. In addition, other even more innovative techniques are examined. The conclusion of this survey is that for most railroad grade crossing applications, the existing standard techniques (reliance on ac primary power and standby storage batteries) will continue to be the preferred choice. In a number of circumstances in which the provision of ac primary power is very expensive, the combination of solar cells or thermoelectric generators as the primary source, with storage batteries as standby, will be optimal.

Research sponsored by the Federal Railroad Administration, Office of Rail Safety Research, under contract to the Transportation Systems Center, Cambridge, Massachusetts.

Holmstrom, FR

Lowell University Research Foundation, (DOT-TSC-FRA-76-15) Final Rpt. FRA-OR7D-76-286, Sept. 1976, 26 pp, 4 Fig., 1 App.

Contract DOT-TSC-589

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS

06 147679

**SHIPPER BENEFITS DERIVABLE FROM AUTOMATIC CAR IDENTIFICATION SYSTEMS**

This study identifies and places a value on benefits to railroad shippers resulting from the full implementation and use of an Automatic Car Identification (ACI) System meeting the current specification of the Association of American Railroads (AAR). It is first known study analyzing benefits to shippers, as opposed to carrier benefits, although the latter are also discussed. The study estimates that shippers would realize from rail service improvements alone an annual savings of \$322 million. The savings are attributed to (a) increased service reliability and (b) accurate real-time car location messages. Study contends such improvements would stimulate demand for rail service and should result in a capitalized value of the net cash flows to the railroads (over 20 year period) of \$251 million.

Research was sponsored by the Computer Identics Corporation, Westwood, Massachusetts.

Gellman Research Associates, Incorporated Final Rpt. Nov. 1976, 90 pp, 49 Ref.

ACKNOWLEDGMENT: Computer Identics Corporation

ORDER FROM: Computer Identics Corporation 31 Dartmouth Street, Westwood, Massachusetts, 02090

06 147826

**ACOUSTIC ASPECTS OF RAILWAY VEHICLE DESIGN**

The paper describes the present acoustic environment in railway passenger vehicles, and discusses the various mechanisms leading to this. The factors providing a basis for an internal noise criterion are stated, and suitable criteria for different classes of stock suggested. A more detailed discussion is presented of various problems encountered during investigation, and of the experiments and analytical techniques evolved during their solution. It is pointed out where the experience gained in this work can be applied, and also where gaps still remain to be filled by future investigation.

Eade, PW Stanworth, CG *Institution of Mechanical Engineers Proceedings* Vol. 190 N 58/78, 1976, pp 515-525

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

06 147832

**COMPUTER-AIDED TRAFFIC CONTROL BETWEEN MAJOR RAILWAY CENTRES**

The paper outlines the Operating Procedures used at present for much of the S.N.C.F. system and the need for certain improvements. Details of a new system are given and its operation on two sections with particular reference to train description and visual display units discussed.

Presented to the Institution of Railway Signal Engineers, Toulouse, 24 September, 1976.

Retiveau, R

French National Railways 1976, 14 pp

ACKNOWLEDGMENT: British Railways

ORDER FROM: French National Railways 88 Rue St Lazare, 75436 Paris, France

06 148290

**THYRISTOR CONTROL OF LOCOMOTIVES AND ITS INTERFERENCE ON DATA TRANSMISSION**

The practically inertialess thyristor controls the tractive power of locomotives very efficiently but this type of phase angle control produces a severe harmonic distortion of the contact wire current. The higher order harmonics interfere with the communication signals in the adjacent telecommunication lines. Measurements were made to determine the impairment of data

transmission comprehensive. After a brief review of thyristor control, the test condition and the program of measurement are discussed. The method of evaluation, which is outlined in this paper consists of two stages: an exploratory stage, where the currents and voltages are compared with each other and the final stage, the probability of bit error with different types of modulation are assessed.

This paper was presented at the IEEE's First Symposium and Technical Exhibition on Electromagnetic Compatibility in Montreux, Switzerland, May 20-22, 1975.

Das Gupta, PC (Siemens, Munich, West Germany) *Institute of Electrical and Electronics Engrs Proc* Proceeding 75CH1012-4 MONT, 1975, pp 486-488

ACKNOWLEDGMENT: EI  
ORDER FROM: IEEE

06 148304

## EFFECT OF NOISE ON TRANSMISSION PERFORMANCE OF TELEPHONE CIRCUITS DUE TO THYRISTOR-CONTROLLED TRACTION

The question of how far the growing use of thyristor controlled railway traction affects telephone transmission quality due to induced noise voltages was investigated by performing a practical experiment. A demonstration was arranged whereby 30 persons had to assess the quality impairment by means of listening tests. The test conditions are described and as a general result it can be stated, that the CCITT limit for the permissible noise e.m.f. of 1 mv has to be retained unchanged.

This paper was presented at the IEEE's First Symposium and Technical Exhibition on Electromagnetic Compatibility held at Montreux, Switzerland, May 20-22, 1975.

Hannig, R (Siemens, Munich, West Germany) *Institute of Electrical and Electronics Engrs Proc* Proceeding 1975, pp 402-406

ACKNOWLEDGMENT: EI  
ORDER FROM: IEEE

07 130218

**RAILROAD PSYCHOLOGY [Zheleznodorozhnaia psikhologiya]**

This book presents the fundamental problems of contemporary technical psychology from the point of view of the scientific organization of labor in railroad transport. At the beginning of the twentieth century psychology began to be applied to various fields of technical science, among them the railroad. Railroad psychology is a distinctive field whose object is the study and rationalization of dynamic informational models occurring in the brain of representatives of the fundamental professions in railroad transport and ensuring the fulfillment of labor activities. The development of production capabilities, the inculcation of automatic and remote control means had led to a situation where scientific organization of labor necessitates utilization of regularities research and discovered by psychological science: this has increased due to the higher relative weight of psychological and mental activity in the human being. In this regard the railroad transport professions-locomotive driver, station master, dispatcher--present the highest requirements for psychological characteristics. The reaction speed, the capability of maintaining alertness to extraordinary events over an extended period of time, and the ability to quickly and accurately determine various unexpectedly arising complex tasks. The main goal of this publication is to reveal the very process of psychological research but the detailed exposition of the methods of experimental psychological research allow the book to be utilized in the capacity of a textbook for the organization of labor according to psychological rationalization of the labor activity of the human being. It covers the principles of planning and evaluation of the organs of management, the means of display, the construction of complex controller stands, professional selection, and controls for alertness. A special section deals with contemporary problems in the automation of psychological activity during the realization of control processes, as well as new methods of cybernetic modeling based on psychological research. The book is intended for a wide range of workers and specialists including cybernetic engineers, engineers, psychologists, physiologists, and doctors of hygiene. The chapters include the subject and methods of railroad transportation, psychology of the engineer and the work of the locomotive driver, thought processes of train dispatchers, the formation of model systems of the brain, the functional stability of such systems professional psychological selection; finally problems of cybernetics in transport. [Russian]

Abstract only is available in English, original untranslated as of November 1976. The corporate author of this book is unknown.

Pushkin, VN Nersesian, LS

Transport Publishing House 1972, 240 pp, 41 Fig., 28 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

07 130305

**METHODOLOGICAL MATERIALS AND SCIENTIFIC REPORT NO. 34 [Metodicheskie materialy i nauchnye soobshcheniia]**

The following reports are included: (1) The realization of Lenin's will for the development of railroad transport and the preservation of health; (2) Lenin and the scientific organization of work; (3) Fundamental results and directions of research in work hygiene in railroad transport; (4) The function of reports and professional selection; (5) The toxicological study of chemical factors of the external environment; (6) Work hygiene, toxicology, and professional pathology during painting of the rolling stock; (7) Results of research on unified ventilator assemblies; (8) Reality of limiting noise and vibration for passenger cars; (9) The problem of hygiene evaluation of polymer materials; (10) Experience in developing a manual for a "system of objective evaluation of conditions, load, and pressure of work"; (11) Psychological engineering aspects in the evaluation and planning of the work place of the mechanics; (12) Nerve overload and fatigue as indicators of work capability of individuals occupied emotionally by pressured intellectual activity; (13) The experience of the USSR railroad with thermal clothing; (14) Theoretical bases of the phenomenon of color absorption and its meaning for clinical and physiological hygiene; (15) Problems of preventive sanitary supervision in planning and construction of railroad lines. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways, All-Union Scientific Res Inst of Railroad Hygiene 1970, 48 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

07 130306

**HYGIENE, PHYSIOLOGY AND EPIDEMIOLOGY IN RAILROAD TRANSPORTATION [Gigiena, fiziologiya i epidemiologiya na zheleznodorozhnom transporte]**

This compendium contains the following reports: (1) The Sixth International Congress on the prevention of accidents and occupational illness; (2) Some questions of hygiene characteristics of contemporary locomotives; (3) Research on functions of learning with a view to professional selection of mechanics; (4) The state of hearing functions in railroad transport railcar inspectors; (5) Hygienic evaluation of work conditions of workers in the ice enterprises of the Ministry of Railroads; (6) Research into the capability of locomotive engineers to evaluate distances; (7) Hygienic characteristics of the climate of several points in the Northern railroads; (8) Several indicators of production trauma on the Dnieper railroad; (9) Rheographic research on dispatcher service workers under production conditions; (10) The dynamics of arterial pressure in workers in cold plants; (11) The effects of insecticides; (12) Objective methods of research on the protective functions of special clothing; (13) The retention of fluorine, iodine, copper, and zinc in water sources of the centralized water supply in the Celinograd section of the Kazakh railroad. The report also contains a supplement on exchange of experience: this deals with an accelerated method for analysis calculation with the aid of tables; modification of the chromatic method of definition of lead in the air; sanitary hygienic characteristics of microclimate of basic sections of the Gordy railroad station; and finally, typical railroad construction projects. [Russian]

Abstract only is available in English, original untranslated as of November 1976. This is from the collection of scientific works "Sbornik nauchnykh trudov."

USSR Ministry of Railways, All-Union Scientific Res Inst of Railroad Hygiene No. 42, 1972, 49 pp, 19 Fig., 12 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

07 130307

**HYGIENE, PHYSIOLOGY AND EPIDEMIOLOGY IN RAILROAD TRANSPORTATION [Gigiena, fiziologiya i epidemiologiya na zheleznodorozhnom transporte]**

The summary contains the following reports: (1) Results and basic directions in the development of occupational pathology in railroad transport; (2) Comparative evaluation of the state of health of locomotive crew members; (3) Clinical symptomatology of locomotive crew workers with increasing arterial pressure; (4) Arterial blood pressure in locomotive engineers; (5) Condition of hearing in electric and diesel locomotive crew members according to tonal audiometrical data; (6) The question of vibrational illness in railroad transport; (7) The problem of the effect of production factors on the health condition of track machine mechanics; (8) Some data from gynecological examinations of female guards on passenger cars; (9) The state of health of ticket cashiers; (10) Some clinical changes in workers who work with crosstie-impregnating oils; (11) Occupational sick rate and measures for lowering it on the West Siberian railroad; (12) Occupational skeletal pathology in female insulators and electrical winders of electrotechnical enterprises of the Ministry of Railroads; (13) Methodological problems in radio isotope cardiography. Normal indices of central hemodynamics in reproductive and growth aspects. [Russian]

Abstract only is available in English, original untranslated as of November 1976. This is from the collection of scientific works "Sbornik nauchnykh trudov."

USSR Ministry of Railways, All-Union Scientific Res Inst of Railroad Hygiene No. 39, 1972, 47 pp, 12 Fig., 16 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

07 133113

**THEORY, METHODOLOGY, AND FINDINGS IN MODE CHOICE BEHAVIOR**

This report represents an exploration into the modeling of mode choice from a strictly psychological theoretic standpoint. As such, previous references to

the mode choice literature are felt by the authors to be inappropriate because: (1) There are no standards for comparison; (2) research has not dealt with the real world prediction of mode choice; and (3) results are too preliminary to base comparisons upon. Nonetheless, the research reported here is within the domain termed 'behavioral modal split models' but it is clearly different in its psychological orientation and experimental methodology. This research was designed to: (1) Test the feasibility of laboratory type experiments for transportation research, specifically mode choice; (2) test the applicability of methodology developed in experimental judgment studies to such experiments; and (3) draw conclusions based on (1) and (2) which would lead to recommendations for further research.

Louviere, JJ Beavers, LL Norman, KL Stetzer, FC  
Iowa University, Urban Mass Transportation Administration, (UMTA-IA-11-0002) UMTA-IA-11-0002-73-2, July 1973, 53 pp

ACKNOWLEDGMENT: NTIS  
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PB-251188/5ST, DOTL NITS

07 137005

#### A SURVEY OF METHODS FOR ESTIMATING THE COST VALUE OF A HUMAN LIFE

This report presents a literature search of existing methods and philosophies for the valuation of a human life. A survey is also made of various federal, state, and local agencies and organizations to determine how life valuation methods are currently being applied to make funding decisions within these organizations. The various methods and costing components defined by these surveys are compared and examined for potential application to Coast Guard cost-benefit analyses.

Cornell, M Daniels, P Kirkland, J Wolff, A  
Operations Research, Incorporated, United States Coast Guard Final Rpt.  
USCG-D-66-76, May 1976, 73 pp

Contract DOT-CG-31446-A

ACKNOWLEDGMENT: NTIS  
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AD-A026259/2ST, DOTL NITS

07 137692

#### AMPHETAMINES AND DRIVING BEHAVIOUR

Direct evidence concerning the role of amphetamines in highway accidents is scant. Laboratory data indicate that most of the basic skills involved in driving are not adversely affected by amphetamine dosages within the normal clinical range, and may in fact be slightly enhanced. Such enhancement is generally greater in sleep-deprived subjects, but is not limited to states of sleep deprivation. Enhancement has also been reported in subjects whose skills have been degraded by alcohol, although results have not been consistent across performance measures. Although there is some evidence that amphetamines induce overconfidence or increase risk acceptance, the effects reported have been neither so strong nor so consistent as to justify much of the apparent concern. Excessive or prolonged "spree" use is widely recognized to result in abnormal psychological states that are incompatible with safe driving performance, and known amphetamine abusers have been found to be involved in disproportionate numbers of highway accidents. Available epidemiological statistics are inadequate to establish how often such excessive consumption is associated with driving, or in any other way to quantify the total contribution of amphetamine abuse to traffic accidents. /Author/ /TRRL/

Hurst, PM *Accident Analysis and Prevention* Vol. 8 No. 1, Feb. 1976, pp 9-13, 16 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-218757)  
ORDER FROM: ESL

DOTL JC

07 139483

#### TRAINING OF PERMANENT WAY STAFF IN THE EASTERN REGION OF BRITISH RAILWAYS

Describes the Chief Civil Engineer's Regional Training Organization, how training is arranged and how it is carried out.

Muir, JH *Permanent Way Institution, Journal & Rpt of Proc* Vol. 94 No. 1, 1976, p 36

ACKNOWLEDGMENT: UIC

ORDER FROM: Derry and Sons, Limited Canal Street, Nottingham, England  
DOTL JC

07 139495

#### ASPECTS OF INDUSTRIAL MEDICINE IN MAJOR TRANSPORT OCCUPATIONS [Arbeitsmedizinische Aspekte wichtiger Verkehrsberufe]

No Abstract.

Theisen, W *Aerztliche Dienst der DB* Vol. 36 No. 3/4, 1975, pp 37-50, 1 Tab., 23 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: German Federal Railway Darmstadt, West Germany

07 141114

#### CONTINUOUS VERSUS INTERMITTENT DISPLAY OF INFORMATION

It is common in systems in which humans and machines continually interact for the human to have to comprehend an informational display in a fixed amount of time. If information is displayed for a fixed amount of time, it is usually presented continuously rather than intermittently. Although there is some literature to support this practice, it is scarce. This paper suggests that a continuous display is optimal in certain instances only, while in other cases, repeated presentations of the same information leads to a higher retention rate. The paper also proposes an equation relating the number of items reported to the total time the information is displayed and to the number of presentations. To reconcile the apparent contradiction in optimal methods of presentation, the paper identifies three stages in the processing of visually presented information.

Hepler, SP (Wayne State University) *Human Factors* Vol. 18 No. 2, Apr. 1976, pp 183-188, 5 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

07 141416

#### CORRELATION OF OBJECTIVE AND SUBJECTIVE BUS-RIDE RATINGS

This paper describes research concerning the establishment of a correlation between objective and subjective comfort ratings of vehicles traversing rough roads. The absorbed power comfort criterion was used in an amplitude-frequency-distribution format for the objective measure. The objective ratings were then correlated with passenger subjective responses obtained on a city bus traversing 17 distinct road segments. The correlation of absorbed power as an objective ride measure to the subjective evaluation for the bus data was successful. For some individual bus rides, the correlations were poor, but, when a sufficient number of rides were used to give a reasonable sample base, an excellent correlation was obtained and can be expressed mathematically as a logarithmic function. Finally, preliminary correlation of absorbed power with International Standardization Organization standards further enhanced the bus ride and absorbed power correlation numbers since the absorbed powers obtained were of the same order of magnitude for both correlations. Although it would then appear that one could just use International Standardization Organization standards, there is no way to add the effect of multidegrees of freedom. On the other hand, the absorbed power provides a method of adding the effects due to the three major directions plus the pitch and the roll.

Prepared for the 54th Annual Meeting of the TRB held in Washington, D.C.

Park, WH Wambold, JC (Pennsylvania Transportation Institute) *Transportation Research Record Conf Paper* No. 584, 1976, pp 55-63, 2 Fig., 5 Tab., 10 Ref.

ORDER FROM: TRB Publications Off

07 141562

#### A HUMAN MODEL FOR MEASURING RIDE QUALITY

Desirable ride characteristics and acceptable noise and visual impacts on the environs all depend on basic decisions concerning vehicle design and maintenance, as well as on the structure and form of guideway for self-steering vehicles. This method for measuring vehicle ride quality can be

used for all types of transportation systems. It is based on absorbed power, a method developed in the late 1960's but not extensively utilized. Recent developments for handling random data have cast a new light on its use as a comfort criterion. Because amplitudes of motion, as well as frequency, are identified, it is easy to recognize what is causing ride deterioration. The system consists of a dummy which carries instrumentation to measure comfort parameters in three axes, although only the vertical axis presently simulates human response.

Wambold, JC Park, WH (Pennsylvania Transportation Institute) *ASME Journal of Mechanical Engineering* Vol. 98 No. 7, July 1976, pp 30-34, 7 Fig., 19 Ref.

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DOTL JC

07 142276

**RESEARCH INTO THE BIOLOGICAL EFFECTS OF ELECTRIC AND MAGNETIC FIELDS [Recherches sur les effets biologiques des champs électrique et magnétique]**  
No Abstract. [French]

*Revue Generale de l'Electricite* Special No., July 1976, 102 pp, Figs., Tabs., Refs.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

07 144015

**THEORY BACKGROUND FOR STUDY OF BART'S IMPACTS ON HUMAN PERCEPTION AND RESPONSE**

This paper relating to BART impacts provides a review of behavioral science literature relevant to human perception and response. It outlines a possible strategy for the use of behavioral science theory: a conceptual model of the impact process is suggested which includes the element of human response and its determinants. An extensive bibliography is also included.

Prepared in cooperation with Gruen Associates, Los Angeles, Calif. and De Leuw, Cather and Co., San Francisco, Calif. Report on BART Impact Program.

Carp, FM  
Metropolitan Transportation Commission, Department of Transportation, Department of Housing and Urban Development, Gruen Associates, Incorporated, De Leuw, Cather and Company Work Paper DOT-BIP-WP-23-4-76, Mar. 1976, 62 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-258368/OST, DOTL NTIS

07 144458

**GENERAL COURSE AND PRINCIPLES ON TECHNICAL OPERATION OF RAILWAYS**

This book describes the basic technology of railways: Track and structures; locomotives and cars; automation; remote control and communications; power supply for electrification; classification yards; loading methods; equipment maintenance and operations. The theory of railway transport and of train operation is explained. Rules and standards for operation of USSR railways are described, aimed at insuring safe, reliable transportation. The book has been approved as a textbook for technical high schools of railway transport. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

Transport Publishing House 1974, 368 pp, 214 Fig., 10 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

07 145562

**A SURVEY OF ALCOHOL AND DRUG ABUSE PROGRAMS IN THE RAILROAD INDUSTRY**

A survey of 20 industrial alcoholism and counseling programs run by railroad corporations covering 58 variables was made by semi-structured interviews of program directors, union officials, and by questionnaires applied to individual clients. Descriptions of program policy, practices, penetration rates, success rates, relationships to discipline and client population parameters are given along with other topical areas. A factor analysis and intercorrelations between all variables measured are also displayed. Included is a comprehensive literature review on Industrial Alcoholism programs covering topics parallel to the survey.

(PC A11/MF A01)

Hitchcock, LC Sanders, MS

Naval Weapons Support Center, Federal Railroad Administration Final Rpt. NWSC/CR/RDTR-38, FRA/OPPD/ORD-76/283, Nov. 1976, 244 pp

Contract DOT-AR-64216

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-259470/3ST, DOTL NTIS

07 147684

**ONE FOR THE (RAIL) ROAD**

The ways that individual railroads are confronting the problem of employee alcoholism and the involvement of the Federal Railroad Administration are described. Low-keyed programs aim at conquering the problems of 25,000 railroads with records kept confidential.

Shaffer, FE *Modern Railroads/Rail Transit* Vol. 31 No. 10, Oct. 1976, pp 65-67, 2 Phot.

ACKNOWLEDGMENT: Modern Railroads/Rail Transit  
ORDER FROM: ESL

DOTL JC

07 148276

**STUDIES OF FREIGHT TRAIN ENGINEER PERFORMANCE**

As a part of the International Government-Industry Program on Track Train Dynamics, the performance of engineers in freight train handling was studied by recording and analyzing train operations and engineer responses under field conditions. Data collection took place during regular revenue freight operations over five representative railroads containing varied terrain and operating conditions. Data collection was accomplished by using a digital data acquisition system specifically designed for this study. Levels of engineer performance was evaluated through the use of an objective rating form specifically designed for this study. Scores on this form was correlated with digitally recorded data. Engineers was found to consistently respond to changes in locomotive drawbar force as indicated on the cab loadmeter. Higher-rated engineers tended to make fewer and more accurate responses than lower-rated engineers. No systematic pattern of response to cab accelerations was found, nor was a systematic change in smoothness of performance revealed over the length of a trip. Frequency of the use of various controls was found to depend more on railroad terrain and procedures than on individual engineer skills.

Research was sponsored by the Federal Railroad Administration, DOT.

Sussman, ED Ofsevit, D

Transportation Systems Center, (DOT-TSC-FRA-76-31) Final Rpt. FRA/OR&D-76-306, Dec. 1976, 72 pp, Figs., Tabs., 4 App.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

08 081514

**FATAL TRAIN-VEHICLE COLLISIONS IN MICHIGAN**

In a seven-year period (January 1964-December 1970) there were 13,458 fatal automobile accidents in Michigan, of which 366 (2.7%) were rail-road-vehicle (R-V) collisions. Data from the Michigan Fatal Accident file provided the basis for a study of some basic features of fatal R-V accidents, and the HSRI computer plotting program was used to generate a map indicating the geographical distribution of R-V fatality occurrence in Michigan for the seven-year period. Several factors emerged which appear to distinguish this class of fatal accidents from the class of overall fatal automobile accidents. For example, two-thirds of the fatal R-V accidents occur during the daytime (notably during peak traffic periods), whereas more than one-half of the overall fatal automobile accidents occur during nighttime. In addition, 52.5% of the fatal R-V accidents involved failure to observe a traffic control device, a violation that was involved in only 8.2% of the overall fatal accidents.

Green, JA

Highway Safety Research Institute Apr. 1972, 4 pp, 4 Fig., 3 Tab., 2 Ref.

ACKNOWLEDGMENT: National Safety Council, Safety Research Info Serv (720429 R)

ORDER FROM: Highway Safety Research Institute Huron Parkway and Baxter Road, Ann Arbor, Michigan, 48105

08 098629

**INFLUENCING FACTORS FOR RAILROAD-HIGHWAY GRADE CROSSING ACCIDENTS IN FLORIDA**

Multiple regression was used to investigate the influence of physical factors on accident rates at 1,140 rail-highway grade crossings in Florida. Selection of the final model involved examination of residuals, transformation of variables, dummy variables and interaction terms. Variables in the final model were functions of average daily traffic, type of crossing protection, maximum train speed, trains per day, crossing speed limit, and number of lanes of traffic. Transformations were made to return estimates to the original scale of the data. Suggestions were made for improving the model and the data. /Author/

Van Belle, G Meeter, D Farr, W (Florida State University, Tallahassee) *Accident Analysis and Prevention* Vol. 7 No. 2, June 1975, pp 103-112, 7 Tab., Refs., 1 App.

ACKNOWLEDGMENT:

ORDER FROM: ESL

DOTL JC

08 099591

**A REVIEW OF RAILWAY LEVEL CROSSINGS IN RELATION TO ROAD SAFETY**

This project was to establish the reduction in accidents, injuries and fatalities that could be expected in Australia from the provision of appropriate protection systems at level crossings in urban and non-urban situations. The report is based upon a review and analysis of Australian and overseas research and practice. It was found that most level crossing accidents do not involve a train. More injury accidents but few fatalities occurred when there was no train involved. The fatality rate when a train was involved was high. Rail crossing accident countermeasures are not always effective. A bridge may be as dangerous as the crossing it replaces. Accident severity generally decreased following installations of gates and boom barriers, flashing signals, improved train braking, flashing train mounted devices, and improved visibility of track and train. Passive warning devices should be, but usually are not, very effective, as with train mounted impact reduction devices. Hazard increased between 6 a.m. and 4 p.m. and depended on quadrant visibility at the crossing site. A greater hazard occurs at crossings where trains operated in high speed ranges. Equations for hazard indices and accident prevention formulae are given. There is a clear need for a coordinated study to examine the problem of railway crossing accidents in Australia. /MW/

Sponsored by the Australian Dept. of Transport.

Ogden, KW Patton, TA Clark, N

Monash University, Australia, Melbourne University, Australia NR/10, June 1973, 122 pp, Tabs., 29 Ref.

ACKNOWLEDGMENT: National Safety Council, Safety Research Info Serv (SRIS-750402R)

ORDER FROM: Monash University, Australia Department of Civil Engineering, Clayton, Victoria 3168, Australia Melbourne University, Australia Department of Civil Engineering, Parkville, Victoria 3053, Australia

08 127548

**CRASHES AT RAILWAY LEVEL CROSSINGS**

The 486 accidents reported by Police to have occurred at railway level crossings in New South Wales in the four years 1966 to 1969 were studied. Less than half were collisions between a motor vehicle and a rail vehicle. The remainder were mostly collisions between motor vehicles and fixed objects such as the crossing gates, fences, signposts and so on. The distribution of reported motor vehicle speeds in the latter group approximated the normal distribution. However, the reported speeds of motor vehicles that collided with rail vehicles followed the negative exponential distribution. This implies that exposure time at the crossing has an influence on the incidence of accidents. Consequently, there is a possibility that a legal requirement that a vehicle stop at a crossing it is otherwise free to cross may increase rather than decrease its risk of collision by prolonging the time it will spend in the conflict area. At some crossings sight distances, the approach speeds of trains and the performance limits of motor vehicles will so combine that automatic train-actuated warning devices will be the only reliable protection against collision. Surveys of motor vehicle speeds at crossings having a variety of environmental conditions and methods for controlling road traffic showed that a crossing open to motor vehicles has little influence on the speed of them, and that the drivers traversed the crossings at speeds which were not significantly different from their speeds on adjacent road sections with similar geometry and other characteristics. The distribution of vehicle speeds traversing crossings approximated the normal distribution. The spatial distribution of both groups of accidents (motor vehicle-rail vehicle collisions and motor vehicle/fixed object collisions) over the 2,790 level crossings in New South Wales followed a Poisson (random) distribution.

Messiter, GF

New South Wales Dept of Motor Transport, Australia 1/72, Mar. 1972, 35 pp, 18 Fig., 8 Tab.

ACKNOWLEDGMENT: National Safety Council, Safety Research Info Serv (SRIS 750696R)

ORDER FROM: New South Wales Dept of Motor Transport, Australia Traffic Accident Research Unit, Rothschild Avenue, Roseberry, Sydney, New South Wales 2018, Australia

08 130241

**HANDBOOK FOR ESTABLISHING AND MAINTAINING CROSSINGS [Instruktsiia po ustroistvu i obsluzhivaniiu pereezdov]**

This brief handbook contains the following information; (1) General principles; (2) Arrangement and equipping of crossing; (3) Maintenance and repair of crossings; (4) Servicing of crossings; (5) Basic requirements for the utilization of artificial constructions for the passage of traffic and for the driving of stock. The appendices cover: (1) Basic requirements for equipping crossings with automated systems; (2) List of basic procedures fulfilled during capital repair of crossings; (3) Instructions on the technology of safety and of production sanitation for crossings attendants; (4) An issue from "Railroad traffic rules" (ch.vii-passage of crossings, pedestrian crossings, general transportation and railroad train stops); (5) Rules for driving stock across the railroad; (6) Plan for distribution of devices, signs, and tables before guarded crossings in populated areas, before unguarded crossings in populated areas, before unguarded crossings outside populated areas; finally, the pamphlet discusses clearance gates, divisional beams, and safety island, which are carefully described in the figures. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Transport Publishing House 1974, 97 pp, 13 Fig., 1 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

08 132208

**REPORT OF PRELIMINARY ASSESSMENT OF URBAN RAILROAD PROBLEMS FOR BLOOMINGTON, INDIANA**

In the course of studying provision of ambulance and fire service to portions of the city which could be isolated by presence of trains on either of two railroads traversing the city, Bloomington obtained assistance from the

Federal Railroad Administration's methodology as detailed in "Urban Railroad Relocation." This led to a broader study than originally planned. The recommended short range approach includes investigation of a communication facility indicating status of grade crossings, consideration of an emergency vehicle overpass and improvements at existing crossings to reduce highway user costs. Long range approaches recommended are grade crossing eliminations and possible relocation of one of the railroads on to the right-of-way of the other.

Office of the Mayor No Date, 20 pp, 1 Tab.

ORDER FROM: Office of the Mayor Bloomington, Indiana

DOTL RP

08 133202

**RAILROAD/HIGHWAY ACCIDENT REPORT: SOUTHERN PACIFIC TRANSPORTATION COMPANY FREIGHT TRAIN/AUTOMOBILE GRADE CROSSING COLLISION, TRACY, CALIFORNIA. MARCH 9, 1975**

About 1:45 a.m. on March 9, 1975, three teenagers were killed when their auto, moving at a speed of more than 50 mph, struck the side of the leading car of a slow-moving freight train at a crossing irregularly used by trains. The presence of the crossing was indicated by warning signs 500 feet and 380 feet in advance of the crossing and by crossbucks at the crossing; a train flagman at the crossing was unsuccessful in his attempts to stop the automobile. The driver's blood alcohol level was 0.14 percent and the passengers' blood alcohol levels were 0.10 and 0.09 percent. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the automobile driver to make a proper approach to a known, identified crossing, and his failure to respond to the flagman's signals or to observe the train at, or on, the crossing until it was too late to avoid impact. The driver's failure to respond probably was caused by the influence of alcohol.

National Transportation Safety Board, D.C. Bureau of Surface Transportation Safety. NTSB-RHR-76-1, Feb. 1976, 31 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-251485/9ST, DOTL NTIS

08 134864

**TOWARD MORE EFFECTIVE GRADE-CROSSING FLASHING LIGHTS**

Pairs of alternately flashing, red incandescent lamps have been the primary motorist warning device at grade crossings for several decades. Although significant evolutionary improvements have occurred, basic constraints (on power consumption, in particular) have limited the total effectiveness normally found. Tightly focused beams, which are necessary to obtain high intensity at low power levels, make perceived brightness highly dependent on both motorist position and precise alignment, which is difficult and expensive to maintain. Examination of appropriate literature and existing standards has made possible delineation of functional specifications and desirable characteristics of motorist warnings for use at grade crossings. Significant improvement is possible through the use of xenon flash lamps in standard crossing mountings, in place of or in concert with conventional lights. The short-duration flash of the xenon unit appears to offer a warning of markedly greater effectiveness. This result is obtainable with little deviation from the basic framework of applicable standards, motorist familiarity, and conventional equipment. This paper includes discussion of optimal specifications, relevant technology, compatibility with existing systems, and field tests.

Report prepared for the 54th Annual Meeting of the Transportation Research Board.

Hopkins, JB (Transportation Systems Center); Holmstrom, FR (Lowell Technological Institute) *Transportation Research Record* No. 562, 1976, pp 1-14, 6 Fig., Photos., 17 Ref.

ORDER FROM: TRB Publications Off

08 134866

**DRIVER PERFORMANCE IN COUNTERMEASURE DEVELOPMENT AT RAILROAD-HIGHWAY GRADE CROSSINGS**

This paper summarizes the findings of a field demonstration study to determine the requirements for grade-crossing-accident countermeasures.

Information was obtained on driver behavior, knowledge, and attitudes by using the traffic-evaluator system, time-lapse photography, and questionnaires. A review of the safety-related factors brought to the grade-crossing situation by the driver also was made. The review included licensing and education, safety programs, attitudes and habits, and driver-vehicle capabilities and limitations. An extensive analysis of these data suggested countermeasure concepts and determined target populations for countermeasure intervention. Behavior measures were isolated that may be used to discriminate among candidate countermeasures when they are applied in the field-evaluation program presented in the study.

Report prepared for the 54th Annual Meeting of the Transportation Research Board.

Sanders, JH (Biotechnology Incorporated) *Transportation Research Record* No. 562, 1976, pp 28-37, 7 Fig., 2 Ref.

ORDER FROM: TRB Publications Off

08 145008

**BIBLIOGRAPHY 57: RAILROAD-HIGHWAY GRADE CROSSINGS**

Designed to provide a comprehensive and convenient reference document for researchers, highway traffic engineers, railroad signal and crossing engineers, officials in public agencies and the private carrier industry, this bibliography presents 171 selected entries complete with abstracts. The documents cited here are those which are substantive and have made a significant contribution to the state-of-the-art literature in the area of railroad-highway grade crossings. A list of key words is provided which summarizes the subject areas covered. The entries encompass the period from 1950 through mid-1976.

Transportation Research Board 1976, 39 pp

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08 145547

**A METHODOLOGY FOR DETERMINATION OF GRADE CROSSING RESOURCE-ALLOCATION GUIDELINES**

The report describes a computer-aided analytical approach to estimation of the potential benefits, costs, and implementation associated with allocation of grade crossing safety resources. Three types of information are required as input: (1) the grade crossing population, categorized by hazard, location (urban/rural), and existing warning systems; (2) warning system alternatives, characterized by cost and effectiveness; and (3) criteria for acceptable or preferred resource-allocation strategies (required benefit-cost ratio, total resources available, number of fatalities to be prevented, etc). A computer program has been prepared that determines all solutions meeting stated criteria and characterizes them in detail (specifying warning systems for each crossing category). Operation is highly interactive, and requires only seconds of computer time. Examples are presented based upon national statistics, and cases are chosen to indicate sensitivity to uncertainties in input data.

(PC A04/MF A01)

Hopkins, JB Hazel, ME

Transportation Systems Center, Federal Railroad Administration Final Rpt. DOT-TSC-FRA-75-15, FRA/ORD-76/04, Aug. 1975, 68 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-259005/7ST, DOTL NTIS

08 147872

**ANALYSING RAILWAY CROSSING ACCIDENT DATA**

This paper discusses the application of maximum likelihood analysis to the prediction of long-term accident rates at road/rail grade crossings. Theoretical concepts of the method are developed, including significance testing, and it is shown that traditional regression techniques are not usually applicable to sparse data of this type since accidents cannot be assumed normally distributed. Various model forms are developed and discussed from both a theoretical and practical viewpoint. Finally, the application of maximum likelihood methods to a fairly large set of accident data is described and some general conclusions given. /TRRL/

Herbert, AJ (Maunsell & Partners); Smith, NMH (Melbourne University, Australia) *Australian Road Research* Vol. 6 No. 3, Sept. 1976, pp 24-33, 2 Tab., 7 Ref.



ACKNOWLEDGMENT: Transport and Road Research Laboratory  
(IRRD-222998)

ORDER FROM: Australian Road Research Board 500 Burwood Road,  
Vermont South, Victoria 3133, Australia

09 052899

**PROBLEMS OF HIGH STRENGTH BOLTED CONNECTIONS IN STEEL CONSTRUCTION. EFFECTS OF WEATHERING ON THE COEFFICIENTS OF FRICTION OF UNPROTECTED AND PROTECTED FAYING SURFACES**

In slip-proof connections of steel structural elements by means of high-strength bolts, the transfer of forces depends, inter alia, upon the coefficient of friction between the faying surfaces. Previous tests carried out in the context of Question D 90 have investigated the effect upon the coefficient of friction of different methods of preparation and protection of the faying surfaces. This report describes tests designed to investigate the effects of exposing the faying surfaces to weathering before assembly. Grit-blasted and flame-cleaned surfaces, with and without protective coatings, were exposed for periods of three to five months in industrial and marine atmospheres. After assembly, the values of the coefficient of friction were determined under short-term static loading. The results obtained indicate that weathering, either industrial or marine, may in some cases significantly alter the coefficient of friction. With grit-blasted unprotected faying surfaces, the mean value of the coefficient of friction is reduced by exposure in an industrial environment, but virtually unaffected by exposure in a marine environment. With flame-cleaned unprotected faying surfaces which were flame-cleaned again after exposure, a noticeable increase in the coefficient of friction was found. In the case of unprotected faying surfaces, the effect of the different methods used for the first cleaning (prior to weathering) is however generally nullified by three months' exposure. Further tests would be required to confirm that the additional expense of flame-cleaning after exposure, instead of the cheaper cleaning with an appropriate brush, is justified.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D90/RP 3/E, Oct. 1968, 22 pp, 4 Fig., 7 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

09 052956

**EXAMINATION OF STRUCTURES BY MEANS OF FATIGUE TESTS AND VIBRATION TESTS AT RESONANCE. REPORT OF ENQUIRY**

This report contains a survey on the strains to which a component is exposed in service, on the fatigue of materials on their endurance, on the determination of the permissible stresses and on the influence of the various factors on fatigue. After having recalled the various types of testing machines the report gives a brief description of a certain number of resonant fatigue testing machines, the control of the machines and the opportuneness of the programmed tests. The conclusions resulting from the study are the following: Resonant fatigue tests are currently applied both in industrial and in railway operation fields. The designation "resonant fatigue tests on components" is a conventional one, because, in reality, the tested component is exposed to stresses at frequencies different from the natural resonant frequencies actually encountered by the in service.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B65/RE /E, Oct. 1963, 27 pp, 39 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

09 053178

**ASSESSMENT OF THE EFFICIENCY AND AGGRESSIVE POWER OF CLEANING AGENTS. PURCHASING SPECIFICATION AND GUIDE FOR THE DEVELOPMENT OF CLEANING PRODUCTS INTENDED FOR THE EXTERIOR CLEANING OF RAIL VEHICLES**

This specification is concerned primarily with the chemical composition, physical properties and biodegradability of the cleaning products and the methods of determining these properties. It also deals with the estimation of cleaning efficiency and potential damaging effects on materials of construction. Finally, guide-lines are included for the development of new cleaning products.

Restrictions on the use of this document are contained in the explanatory

material.

International Union of Railways E 119/RP 4/E, Apr. 1976, 44 pp, 4 Fig., 3 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

09 130270

**QUALITY CONTROL OF RAILS WITH THE USE OF ELECTROMAGNETIC ACOUSTIC CONVERTERS [Kontrol' kachestva rel'sov s pomoshch'iu elektromagnitno-akusticheskikh preobrazovatelei]**

Due to problems (misalignment of the probe insufficient or excess contact liquid, accumulation of dirt on the running surface of the rail head, etc.) involved in ultrasonic rail inspection, which impair acoustical contact, thereby substantially lower the reliability of results, a contactless (electromagnetic-acoustic) means of excitation and registration of the ultrasonics is envisaged. This work investigates the reflecting shadow method of flaw detection with the utilization of integrated and divided induction coils of the electromagnetic acoustic converters (EMAC). With such a means of control it is possible to isolate two zones in the rail: the web and its continuation into the head and underside and lateral portions of the head. Checking of the first zone is most expediently realized by the EMAC, whose inductor ensures the excitation of the ultrasound oscillations distributed according to the standard of the ground surface. The indicated construction of the EMAC allows for the emission of predominantly transverse waves. The conclusions reached are: (1) For the successful revelation of defects in the web of the rail and its continuation into the head and the underside, the polarization plane of the transverse wave should be oriented normally to the plane in which the development of a defect is expected; (2) The utilization of a transverse wave polarized perpendicularly to the plane of development of the defect allows the exposure of defects not made apparent during inspection by longitudinal waves in the presence of the contact modification of the ultrasonic flux; (3) The proposed designs of the induction coils of the electromagnetic-acoustic converter and the arrangements for sounding of the rails allows the exposure of defects of vertical fissures and separations in the rail web, as well as inclined transverse fissures of fatigue, friable areas, and horizontal separations in the lateral portions of the rail head. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Boldyrev, Iu P Petrov, Iu V *Soviet Journal of Nondestructive Testing* Vol. N 1975, pp 32-37, 4 Fig., 2 Tab., 7 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: ESL

09 130272

**EXPERIMENTAL INVESTIGATION OF THE DYNAMIC DEFECT FIELD WITH MOVING ELECTROMAGNETIC FLAW DETECTION OF RAILS [Eksperimental'noe issledovanie dinamicheskogo polia defekta pri skorostnoi elektromagnitnoi defektoskopii rel'sov]**

This work presents results of experiments carried out on dynamic defect fields, studying the magnetostatic and eddy current components separately and the resulting dynamic defect field. Previously studied were the characteristics of this field on rails magnetized by the moving of the permanent magnet field; an image was obtained of the longitudinal defects. By means of an approximation, the significance of the eddy-current defect field was calculated. The component of the dynamic defect field caused by the magnetized rail was determined in the regular manner by static magnetization. The eddy current component was reproduced under laboratory conditions using a model. The longitudinal inductive current flowing through the rail head under realistic conditions was substituted for by a direct electrical current corresponding to the standard. Conclusions: (1) The eddy current field from rail defects differs from the magnetostatic according to the form, size and amplitude; the longitudinal component of the eddy current field resembles the vertical and transverse components of the magnetostatic field and vice versa; the components of the eddy-current field are two to three times greater in amplitude along the rail. (2) The resulting dynamic field corresponds to the model obtained by summation of the magnetostatic and eddy current fields; the resulting field of internal defects differs from the magnetostatic and resembles the eddy current while the field of joints and rail fissures is closest to the magnetostatic. (2) Results from track inspection cars may be interpreted. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Dovnar, BP Vlasov, VV Shcherbinina, VA *Soviet Journal of Nondestructive Testing* No. 2, 1973, pp 21-27, 3 Fig., 10 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: ESL

09 130273

**THE PRINCIPLE OF CONTACTLESS ULTRASONIC FLAW DETECTION OF RAILS [Printsip beskontaknoi ul'trazvukovoi defektoskopii rel'sov]**

The fundamental deficiency of ultrasonic flaw detection is the necessity of ensuring acoustic contact between the probe and the checked object. In this regard the contactless method of flaw detection is very promising; the ultrasonic oscillations are excited in the checked object by means of electromagnetic-acoustic (EMA) converters. Utilized in the capacity of the converter is a flat coil in the form of a spiral or a special form, onto which is fed a high frequency current impulse. The principle of excitation of the contactless ultrasonic oscillations in the rail metal is effected as the EMA converter operates in simultaneous regimen, and its feeding is realized from the impulse generator pulsations. The coefficient of the converter with contactless means of exciting the ultrasonic oscillations is much smaller than with the piezoelectric converters. Therefore, this means cannot be utilized for flaw detection by the echo method. During operation of the reflecting shadow method, it is possible to obtain several ground reflections, which show promise for contactless means for rail flaw detection. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Boldyrev, Iu P *Put' i Putevoye Khozyaistvo* No. 2, 1974, pp 5-9, 2 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novoryazanskaya ul., Dom 12, Moscow 288, USSR

09 130274

**TEST BENCH FOR CONTACTLESS ULTRASONIC QUALITY CONTROL OF RAILS [Eksperimental'nyi stend dlia beskontaknogo ul'trazvukovogo kontrolya kachestva rel'sov]**

Practical achievement of a contactless means of rail inspection is possible only with the mechanized or automatic process of control. For this purpose a test bench has been worked out in the scientific Research Institute of Bridges of the Leningrad Lenin Order Institute of Railroad Transportation Engineers named after Academician V.N. Obraztsov. The bench contains two fundamental functional assemblies: a mechanical portion (mechanism for extension and fixation of the rail, and a magnetic biasing system with a mechanism for fixing the electromagnetic-acoustic inspection system) and an assembly stand with electronic apparatus. The location of the entire equipment complex is envisaged to be in the same place where operations are carried out. This allows control before the beginning of the welding, and rejection of rails with defects in their basic metal, and secondly, utilization of the mechanism for extension and firm fixation of the rails on the table of a planing machine. The figures include a block plan of the electronic portion of the bench, and a kinematic plan of the bench. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Gurvich, AK Boldyrev, Iu P Starunov, BP *Put' i Putevoye Khozyaistvo* No. 2, 1975, pp 30-36, 2 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novoryazanskaya ul., Dom 12, Moscow 288, USSR

09 130287

**THE APPLICATION OF POLYMETHYLSILOXANE LIQUID PMS-10 IN THE CAPACITY OF A LIQUID DIELECTRIC IN POWER CONDENSERS [Primenenie polimetilsiloksanovoi zhidkosti PMS-10v kachestve zhidkogo dielektrika silovykh kondensatorov]**

Polymethylsiloxane liquid PMS-10 is a transparent, colorless liquid with kinematic viscosity at 20 degree C. of 9-11 poises--the temperature of the scintillation in an open crucible is not lower than 174 degrees C. and the temperature of solidification is not greater than 60 degree C.--it is a composition of linearly structured polymers. According to definition it is a

dampening liquid, as well as a high and low-temperature heat carrier for apparatus. Organic factors for the wide utilization of polymethylsiloxane liquid PMS-10 in the capacity of dielectric impregnation of cellular and paper-film condensers are its high stability, as well as the fact that its electrical characteristics are not normalized by the All-Union State Standard. The table gives electrical characteristics of the liquid according to the data of the electrophysical laboratory; the two figures are (1) a graph of the dependence of the tangent angle of the dielectric losses and dielectrical permeability of the organic silicon liquid PMS-10 upon the temperature, and (2) a graph of the dependence of the specific electrical resistance by the organic silicon liquid PMS-10 upon the temperature. [Russian]

Abstract only is available in English, original untranslated as of November 1976. This article is from the Scientific Technical Collection "Informelectro", the Series "High Tension Apparatus" (Apparaty Bysokogo Napriazheniia).

Khuravleva, TA Peregudova, EN Akhmatzerova, NM 1974, pp 3-4, 2 Fig., 1 Tab., 3 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya pl 32-34, Moscow G-200, USSR

09 133031

**METALLURGICAL ANALYSIS OF A STEEL SHELL PLATE TAKEN FROM A TANK CAR ACCIDENT NEAR SOUTH BYRON, N.Y**

A metallurgical analysis of a steel plate sample (the South Byron sample) was requested by the Federal Railroad Administration. The steel sample was taken from a tank car (number PPGX9990) which had been involved in an accident near South Byron, New York. This sample was reported to have been produced to specification AAR-M-128-65-DTD-1966-Flange Quality-Grade B, and it was reportedly taken from the second course of shell plate of car number PPGX9990. The fracture in this course circumscribed the tank car and resulted in the division of the car into two sections. An investigation was conducted at the National Bureau of Standards to determine if the plate sample conformed with the above Association of American Railroads (AAR) Specifications for Tank Cars and to gather information pertinent to the question of the suitability of this type of steel for use as the shell plate of tank cars.

Interrante, CG Hicho, GE  
National Bureau of Standards, Federal Railroad Administration Final Rpt. NBS-312.01/35, FRA/ORD-75/47, Oct. 1971, K. pp

Contract DOT-AR-10023

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250063/5ST, DOTL NTIS

09 133080

**A STUDY OF STRESS CORROSION PHENOMENA RESULTING FROM TRANSPORTATION OF ANHYDROUS AMMONIA IN QUENCHED-AND-TEMPERED STEEL CARGO TANKS**

The primary causative agent of stress-corrosion cracking (SCC) of quenched-and-tempered steels exposed to liquid ammonia is oxygen contamination. Under certain conditions carbon dioxide and water may also act as causative agents. Water in concentrations of 2000 ppm or greater inhibits SCC. Methane and nitrogen also exhibit inhibitory effects. As produced liquid ammonia contains sufficient oxygen to cause cracking in many cases. The slow-strain-rate method is an accelerated test which produces stress-corrosion fractures with characteristics identical to those of service failures. A statistically determined discriminant function, D sub P, may be used to predict the SCC behavior of production ammonias. Another discriminant function, D sub L, is more applicable for high-purity, methane-and water-free ammonias.

Lyle, FFJ  
Southwest Research Institute, Bureau of Motor Carrier Safety Final Rpt. SWRI-01-4101-001, DOT-FH-BMCS-11-8568, Feb. 1976, 100 pp

Contract DOT-FH-11-8568

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250483/5ST, DOTL NTIS

09 133088

**A METALLURGICAL ANALYSIS OF ELEVEN STEEL PLATES TAKEN FROM A TANK CAR ACCIDENT NEAR CALLAO, MISSOURI**

A metallurgical analysis of eleven steel plate samples designed as Callao samples K-1, K-2, K-3 and K-5 to K-12 was requested by the Bureau of Railroad Safety, Federal Railroad Administration, Department of Transportation. The Callao samples were removed from a tank car numbered GATX 94451 which had been involved in an accident near Callao, Missouri where the ambient temperature was reportedly 15F. An investigation was conducted at the National Bureau of Standards to determine if the plate sample conformed with the Association of American Railroads (AAR) Specification AAR-TC128-65 (flange quality, grade B, fine-grain practice) for high-tensile strength, carbon-manganese steel plates for tank cars, and to gather information pertinent to the question of the suitability of this type of steel for use as plate materials of tank cars.

Interrante, CG Hicho, GE Harne, DE  
National Bureau of Standards, Federal Railroad Administration Final Rpt.  
NBS/312.01/51, FRA/ORD-75/49, Sept. 1972, 175 pp

Contract DOT-AR-10023

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250544/4ST, DOTL NTIS

09 133091

**HAZARDOUS MATERIALS TANK CARS-EVALUATION OF TANK CAR SHELL CONSTRUCTION MATERIAL**

A metallurgical analysis of a steel plate sample (the Bell sample) was requested by the Federal Railroad Administration. The steel sample was taken from a tank car (number 88300) which had been involved in an accident near Bell, West Virginia. An investigation was conducted at the National Bureau of Standards to characterize the steel from the failed tank car and to determine whether the steel meets the specification AAR TC 128-69. Another purpose of the investigation is to determine the nature of the fracture of the head plate of the failed tank car.

Hicho, GE Brady, CH  
National Bureau of Standards, Federal Railroad Administration Final Rpt.  
FRA/ORD-75/46, Sept. 1975, 40 pp

Contract DOT-AR-10023

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250607/9ST, DOTL NTIS

09 133296

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. MATERIALS INSPECTION-1**

This volume contains an overall picture of the function, structure, and operation of the Materials Inspection Division. Included in this volume are the following: Functions of the materials inspection division; Inspections-general information; Introduction-testing laboratories; Physical testing laboratory; Chemical testing laboratory; Cement testing laboratory; Soils testing laboratory; Radiography-testing; Metallography-testing; Construction and road materials-sampling, inspection and testing; Steel and allied materials-sampling, inspection and testing; Procedures for inspection of special track work and truck frames for rapid transit cars.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PC\$70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt., 1 UMTA-IT-09-0014-75-1, Mar. 1975, 318 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-251652/4ST, DOTL NTIS

09 133297

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. MATERIALS INSPECTION-2**

Contents: Specific inspections: paint-sampling, inspection and testing; Lumber-sampling, inspection and testing; Inspection of fuel oils and

lubricants; Uniforms and textile materials-sampling, inspection and testing; Soaps and synthetic detergents-sampling, inspection and testing; Rubber and synthetic rubber, sampling, inspection and testing; Plastics-sampling, inspection and testing; Leather inspection-sampling, inspection and testing; Floor coverings (non-textile)-sampling, inspection and testing.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PC\$70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt., 2 UMTA-IT-09-0014-75-1, Mar. 1975, 409 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-251653/2ST, DOTL NTIS

09 136406

**HIGH SPEED TRAINS NECESSITATE IMPROVED QUALITY CONTROL OF METAL PRETREATMENT**

The advent of the new generation of high speed trains has necessitated a review of the "quality of control" of painting practices. Factors influencing this are change in construction of rolling stock and increased susceptibility to impact damage due to higher running speeds. To meet the high standard required it has been necessary to critically examine initial surface preparation of the steel, the phosphating process and the painting process. Modern trends in workshop practice have led to more frequent repainting of stock. The effects of variable surface preparation and the overstraining of multi-coal oxidizing paint films on the critical balance between substrate adhesion and stress development are also considered.

Bishop, DM (British Railways Board); Timmins, FD *Institute of Metal Finishing, Transactions* Vol. 53 No. t4, Dec. 1975, pp 188-196

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 137227

**EFFECT OF SELF-LOCKING NUTS ON TORQUE-TENSION RELATIONSHIP**

Testing was conducted to determine torque-tension relationship for self-locking nuts. The test results indicated that torque wrench method is not accurate for determining preload when fasteners are preloaded to 75-80 percent of their ultimate tensile strength. The accuracy of torque wrench method deteriorates even more if fasteners are used for more than one cycle application. There was also significant difference in preload between all metal nuts and nuts with nonmetallic insert. The fastener preload variation decreased with larger fasteners. (Author)

Zurko, MJ  
Naval Air Development Center, (A510-5103/001-4/3510) Final Rpt.  
NADC-75359-30, Dec. 1975, 76 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A024893/0ST, DOTL NTIS

09 137232

**STRESSING-CEMENT CONCRETES IN CAST-IN-PLACE AND PRECAST CONSTRUCTION**

The review describes the properties of stressing cement and briefly relates the main processes causing it to expand during hardening. The book presents data on the use of stressing cement in various fields of construction, discussing the features of this type of cement and methods of preparing and curing stressing-cement concretes for various applications. Information also appears on the use of expansive and stressing cements in the U. S. This review is aimed at engineering staff workers in construction organizations, at construction workers, and designers and scientific researchers.

Translation by B. Teague of *Primenenie betonov na naprygayushchem tsemente v monolitnom i sbornomonolitnom stroitel'stve (obzor)*, Moscow, 1975.

Mikhailov, VV Litver, LS Karasev, AK Budagyants, LI Titov, YN  
Sandia Laboratories Dec. 1975, 89p

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

DOTL NTIS

09 137260

**LEACHABILITY OF PENTACHLOROPHENOL FROM RED OAK**

This study was initiated at the request of and in cooperation with the naval ship engineering center of the U.S. Department of the Navy. Their interest stemmed from the fact that naturally durable white oak, which has been used for many years in the construction of minesweepers, has become increasingly difficult to procure. A somewhat leach-resistant preservative is considered necessary if a substitute species of lower natural durability is to be used. The substitute species selected by the Navy was red oak, which is not high in natural decay resistance, but does possess the necessary strength properties. When preservatives were being considered, effects on strength and gluability were prime factors, but cost, human toxicity, and efficacy were also important. Based on these considerations, it was decided that a pressure treatment with pentachlorophenol (PCP) in liquefied petroleum gas would be the most satisfactory, provided the preservative was sufficiently permanent. The purpose of this investigation was to obtain information on the permanence of PCP in red oak when leached in artificial seawater.

Johnson, BR Gjovik, LR Caulfield, DF  
Forest Products Laboratory Res. Paper FSRP-FPL-266, 1975, 12 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A024504/3ST, DOTL NTIS

09 138072

**FRACTURE RESEARCH AT HIGH STRAIN RATES**

Toughness relative to service applications must be derived from specimens reproducing certain features of actual components. British Rail's application of the drop-weight machine is described.

Cannon, DF *Railway Engineer* Vol. 1 N Jan. 1976, pp 22-24

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

09 139454

**FATIGUE LIFE COMPARISONS-OUTER COIL TRUCK SPRINGS (D-5 AND D-7 ALLOY STEEL VERSUS D-5 CARBON STEEL)**

Fatigue tests were conducted on three types of outer coil freight car truck springs. These tests were of constant amplitude cycle type with adjustments for spring set made every 24 hours to maintain an approximately constant stress range. As spring types tested possessed differing spring rates (constants), tests were conducted on an equal energy basis simulating a reasonable service loading. Specimens were cycled to failure or two-million cycles. Resulting data are used to compare fatigue rates of D-5 and D-7 alloy steel outer coils with that of D-5 carbon steel outer coils. Comparisons indicate that outer coil freight car truck springs made of alloy steel possess significantly lower fatigue failure rates than those made of carbon steel. Alloy steel springs also demonstrated a tendency to take less set than did carbon steel springs. As tested, alloy steel outer coils of the D-5 type proved more reliable than the D-7 outer coils.

Direct requests to the Director of Operations.

Misner, GR  
Association of American Railroads Technical Center, (Proj. No. S-319)  
No. R-229, May 1976, 25 pp, 4 Fig., 4 Tab.

ACKNOWLEDGMENT: AAR  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

09 139455

**FINAL PHASE 03 REPORT. MATERIAL STUDY ON STEELS USED IN CURRENT AND FORMER TANK CAR CONSTRUCTION AND FROM CARS INVOLVED IN ACCIDENTS**

A study has been made of the steels used in the construction of pressure tank car tanks as part of the RPI-AAR Tank Car Safety Research and Test Project: The number and type of tests made represent the most comprehensive

ever performed on tank car tank steels. Fracture toughness properties are not a part of the material specifications for tank car tanks except for certain low temperature applications. Non-the-less, the fracture toughness properties were determined using the Charpy V-notch Test, Drop Weight Tear Test, Dynamic Tear Test, and NDT Drop Weight Test for current, accident, and old materials. The fracture properties obtained represent the best properties that are technologically attainable for the current steels for the heat treatment employed. For TC128-B material, no significant transition temperature improvement can be achieved by changing to other pearlitic type steels. It was concluded that the TC128-B steel is an optimum product for the service and that changes are not justified on the basis of the fracture properties.

Sponsored by the RPI-AAR Tank Car Safety Research and Test Project. Direct requests to Director of Operations.

Eiber, RJ Olson, LL  
Association of American Railroads Technical Center Res. Rpt. No. RA-03-5-33, No. R-193, Aug. 1975, 193 pp, Figs., Tabs., 11 Ref., Apps.

ACKNOWLEDGMENT: AAR  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

09 139456

**COMPARISON OF D-5 AND D-7 SPRING FATIGUE LIFE**

The fatigue life of the proposed D-7 freight car truck springs with 4 1/4-in. travel and the standard D-5 springs with 3-11/16 in. travel have been experimentally compared. Due to the unequal travels, the springs were fatigue tested on an equal energy basis for a reasonable service loading. The fatigue tests were of the constant amplitude cycle type to two million cycles. Twenty specimens of each spring variation were tested. Results indicated the proposed D-7 springs have a significantly lower failure rate equal to about one third that of the standard D-5 springs.

Direct requests to J.G. Britton, Director of Operations.

Cook, RM  
Association of American Railroads Technical Center, (Proj. No. R067)  
Res. Rpt. No. R-194, Oct. 1975, 26 pp, 11 Fig., 4 Tab.

ACKNOWLEDGMENT: AAR  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

09 139458

**EVALUATION OF STANDARD AND FRACTURE TOUGH BRITISH RAIL STEELS**

The properties of two fracture tough and standard British rail steels are compared to the properties of AREA rail steels. The nil-ductility transition temperature of the fracture tough steels was found to be in the range 5F (-15C) with fracture toughness values 1.5 to 2.5 times as high as that determined for the AREA steel. The fracture tough grades display a good resistance to shelling under rolling load testing. The lower hardness and tensile properties of the British steels suggest that the AREA steel should have a greater resistance to wear.

Direct requests to the Office of Director AAR Technical Center.

Stone, DH Leadley, GL  
Association of American Railroads Technical Center, (Proj. No. R-034)  
Res. Rpt. No. R-203, Jan. 1975, 39 pp, 24 Fig., 4 Tab., 5 Ref.

ACKNOWLEDGMENT: AAR  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

09 139489

**ANALYSIS OF FATIGUE OF WELDED CRANE RUNWAY GIRDERS**

In recent years, mill building owners and constructors world-wide have observed structural distress in welded crane runway girders. The distress is in the form of fatigue cracks in the vicinity of the juncture of the web and top flange. Structural analyses were made using finite element and classical methods in order to rationally explain the observed cracks and to develop new fatigue-resistant details. The results of the analyses confirmed that the

local stresses produced by the passage of concentrated wheel loads were sufficient to cause fatigue cracks in the presently used structural details. It was concluded that the fatigue cracks were caused by the local effects of the crane wheel loads and the high stress range that occurs due to lack of proper bearing between the stiffeners and flange when a fitted stiffener is used. Therefore, an improved fatigue resistant detail was developed which consists of stiffeners with a deep cope (10-in.; 254-mm) welded to the underside of the top flange with full penetration welds.

Demo, DA Fisher, JW *ASCE Journal of the Structural Division Proc Paper* Vol. 102 No. ST5, No. 12106, May 1976, pp 919-933

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**09 139502****FOR THE DESIGN OF WELDED ALUMINUM JOINTS LOADED BY FATIGUE: PROBLEMS AND SOLUTIONS**

There are four main problem areas when dimensioning welded aluminum joints for fatigue loads: Many different types of joints, with as many different fatigue strengths. Size effect, i.e. most fatigue tests were carried out on small specimens, whereas large structures must be dimensioned. Damage accumulation, i.e. most tests are carried out under constant stress amplitude, while service stresses are random. Scatter of fatigue test results is generally quite large, that is: how to determine allowable stresses from a few test results. The presently available solutions for these problems are discussed and an example is given. [German]

Schuetz, W *Glaser's Annalen ZEV* Vol. 100 No. 2/3, Feb. 1976, pp 41-45

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**09 139540****PHASE 03 REPORT ON FRACTURE PROPERTIES OF TANK CAR STEELS--CHARACTERIZATION AND ANALYSIS**

Questions of fracture characteristics of tank car steels have been fully clarified by statistical examination of fracture properties based on rational fracture mechanics criteria. It is analytically proven that brittle fracture of tank cars is not a significant problem at any temperature of service. This independent finding is in agreement with general experience based on accident investigation and analysis. A clear relationship has been demonstrated between ASTM ferrite grain size and Dynamic Tear (DT) test rational criteria (true fracture mode for full section). It is possible to examine a metallographic sample and to predict within a narrow range of temperature the type of fracture to be expected for a tank car steel. The mechanical significance of deviations from unusual grain structures (such as mixed grain size, etc.) can be understood in terms of heat treatment or fire environments-based on the knowledge generated in this study. The relationship of plastic fracture properties to tearing type rupture of tank cars at elevated temperatures has been clarified.

Direct requests to the Director of Operations, AAR.

Pellini, WS Eiber, RJ Olson, LL  
Association of American Railroads Technical Center, (AAR-R-192) No. RA-03-4-32, Aug. 1975, 81 pp, Figs., 6 Ref.

ACKNOWLEDGMENT: AAR  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

**09 139940****HIGH-STRENGTH CHROMIUM-MOLYBDENUM RAILS**

A laboratory study was conducted to develop an as-rolled rail of over 100 ksi (689 N per sq mm) yield strength. Two 100-ton commercial heats were made of the resulting composition and processed into rails. Laboratory tests showed yields up to 125 ksi. The chromium-molybdenum rails also exhibited excellent fracture toughness and fatigue properties. Sections of the rails were jointed by both flash-butt welding and thermit welding. Hardness peaks produced in the butt welding could be reduced by applying either a postweld current or an induction heating cycle. The high-strength rails have been in service over eight months in curved track of an ore railway.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976.

Smith, YE Sawhill, JM, Jr Cias, WW Eldis, GT  
American Railway Engineering Association *Proceeding* Vol. 77 Bulletin 658, 1976, pp 621-651, 18 Fig., 7 Tab., 4 Ref.

ORDER FROM: ESL

DOTL JC

**09 141001****IMPACT PROPERTIES OF STEELS TAKEN FROM FOUR FAILED TANK CARS**

An overview of the results and metallurgical analyses of the findings of impact tests conducted at the National Bureau of Standards on samples of tank-car materials submitted by the Federal Railroad Administration is presented. The submitted samples were taken from tank cars which had been involved in service accidents during the period January 1970 to January 1971. One of these tank cars had been fabricated from ASTM A212 steel and the remaining four tank cars from AAR TC128 steels. The impact test data were reported earlier in four tank-car accident reports.

Sponsored by the Federal Railroad Administration U.S. DOT.

Interrante, CG

National Bureau of Standards, Federal Railroad Administration,  
(NBSIR 75-656) Final Rpt. FRA.OR&D-75-51, June 1976, 160 pp, Figs., Tabs.

Contract DOT-AR-40008

ACKNOWLEDGMENT: FRA, NTIS  
ORDER FROM: NTIS

PB-255854/2ST, DOTL NTIS

**09 141002****MECHANICAL PROPERTIES OF AAR M128-69-B STEEL PLATE SAMPLES TAKEN FROM INSULATED FIRE TESTED TANK CAR RAX 202**

Studies were undertaken to measure the elevated-temperature mechanical properties and to determine the elevated-temperature fracture behavior of selected AAR M128-B steel plates. In addition, the ambient-temperature mechanical properties were measured to determine if the requirements of specification AAR M128-69-B were satisfied. The NBS results of check chemical analyses, hardness surveys, thickness measurements, macroscopic observations, and metallographic analyses of the plate samples had been reported previously. The results of ambient-temperature tensile tests showed that all plate samples met the strength and tensile ductility requirements of specification AAR M128-69-B. The results of hot-tensile tests showed a continuous decrease in strength properties and an increase in tensile ductility as the test temperature was increased from 1100 F to 1250 F. An analysis of stress-rupture data for specimens from all plant samples in the same temperature range indicated that a straight line in a log-log plot of initial stress versus rupture life reasonably represented the data at each test temperature. In the temperature and stress range studied, a decrease in the initial stress of about 20 to 30 percent resulted in a twelvefold increase in rupture life from 15 minutes to three hours. A comparison of the results of the metallographic analysis of hot-tensile and representative stress-rupture specimens with the previously reported metallographic results on the initial rupture site in the failed shell course indicate the presence of the identical fracture mode. This mode is characterized by many intergranular voids which originate primarily at the proeutectoid ferrite-pearlite boundaries. These results confirm the previously reported finding that the initial rupture of the tank car was a stress-rupture crack.

This is the eight in a series of reports on the properties of tank car steels.

Early, JG

National Bureau of Standards, Federal Railroad Administration,  
(NBSIR 75-725) Final Rpt. FRA/OR&D-76-74, June 1976, 82 pp, 25 Fig., 3 Tab., 19 Ref.

Contract DOT-AR-40008

ACKNOWLEDGMENT: FRA, NTIS  
ORDER FROM: NTIS

PB-255907/8ST, DOTL NTIS

09 141107

**HIGH CYCLE FATIGUE CRACK PROPAGATION UNDER RANDOM AND CONSTANT AMPLITUDE LOADINGS**

This paper essentially summarizes work carried out during the period 1963-1973 into the constant and random amplitude fatigue crack propagation performance of a mild steel at ambient temperature. Conventional fracture mechanics parameters are shown to describe the process of propagation under a variety of mean stress intensity conditions. Calculations of random amplitude propagation using "laws" determined from the constant amplitude data are shown to be in agreement with experimental results. This agreement of calculation and experiment gives confidence in the use of these calculation principles for reactor applications outside direct experimentation.

Pridle, EK (Berkeley Nuclear Laboratory, England) *International Journal of Pressure Vessels & Piping* Vol. 4 No. 2, Mar. 1976, pp 89-117, 40 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 141565

**RAIL PRACTICES IN RUSSIA: WHAT US GROUP FOUND**

The similarities and differences in rail steel metallurgy between the USSR railroads and those in North America as explored in an FRA-Soviet Railway Ministry exchange program are discussed. Chemical and mechanical properties are compared for heat treated and non heat treated rails. To retard the rate of defect formation, USSR railways have adopted fully heat-treated rail as standard and the production process for these is illustrated. The plans for further rail steel research are described. Ultimately the aim is a steel with a 450 Brinell hardness and 235,000 psi tensile strength by increasing carbon content and adding alloys such as boron and vanadium. Rail replacements in track are usually determined by defect formation rather than wear.

Stone, DH *Railway Track and Structures* Vol. 72 No. 9, Sept. 1976, pp 20-22

ORDER FROM: ESL

DOTL JC

09 141649

**EXPERIMENTAL ANALYSIS OF THE DYNAMIC BEHAVIOR OF A MECHANICAL STRUCTURE. CONCEPT OF MECHANICAL IMPEDANCE [Analyse experimentale du comportement dynamique d'une structure mecanique. Concept d'impedance mecanique]**

The experimental method of analysis called "mechanical impedance" (the concept of mechanical impedance is of the same nature as that of electrical impedance) is used to study the dynamic behavior of the structure of the material. It reveals the vibration pattern in any given area of a component. The SNCF Testing Division uses this method to analyse stress patterns in components, to limit the amplitude of certain vibrations, or to monitor the condition of a metallic structure during operation. The applications of this method are shown by means of examples. [French]

Butteaud, B *Revue Generale des Chemins de Fer* May 1976, pp 304-323, 40 Fig., 3 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

09 142514

**CRACK DEPTH MEASUREMENT IN RAIL STEEL BY RAYLEIGH WAVES AIDED BY PHOTOELASTIC VISUALIZATION**

Stroboscopic methods of visualization of ultrasonic waves by schlieren and photoelastic methods have been introduced in recent years. The author describes work which demonstrates the application of the photoelastic technique to a problem of crack-depth sizing in steel rails by Rayleigh waves. The visualization of the interaction of ultrasonic waves in notched glass tapestries provides explanations of multiple A-scan received signals, the origins of which were not previously understood.

Hall, KG (Railway Technical Center, Derby, England) *Non-Destructive Testing* Vol. 9 No. 3, June 1976, pp 121-126, 8 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

09 142515

**ECONOMIC IMPACT OF TRIBOLOGY**

In 1966 a U.K. Government investigation came to the conclusion that by application of tribological principles very large savings were obtainable, in most cases without appreciable capital investment. Tribology was defined as "the science and technology of interacting surfaces in relative motion and of subjects and practices related thereto." In other words, it deals with all aspects of rubbing, sliding and rolling surfaces and includes the subjects of wear, friction and lubrication. Application of tribological principles would lead not only to greater operational reliability, efficiency and productivity, but also to conservation of materials and energy. In less than seven years, the new concept of tribology has been accepted by the majority of the industrial countries as part of their scientific and technological background in the field of obtaining greater plant efficiency, better performance, fewer breakdowns and significant savings in other directions.

Presented at a meeting of the NBS Mechanical Failures Prevention Group, May 8-10, 1975, and published in NBS Special Publication No. 423: Mechanical Failure-Definition of the Problem.

Jost, H Peter, KS

National Bureau of Standards Proceeding Spec. Pub. No. 423, Apr. 1976, pp 117-139, 21 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: National Bureau of Standards Technical Analysis Division, Gaithersburg, Maryland, 20760

09 142535

**APPLICATION OF FINITE ELEMENT DYNAMIC ANALYSIS TO FRACTURE MECHANICS**

In this paper the authors present several applications of finite element dynamic analysis to two-dimensional fracture mechanics problems. The finite element method for the dynamic analysis possesses the same advantages as for the static case, i.e. the feasibility to cope with complex geometries and material compositions. The first example presented concerns the dynamic stress and strain analysis for elastoplastic plates with geometrical singularities using superposition techniques. In the second example, the dynamic propagation of a two-dimensional crack is analyzed numerically with the simultaneous use of the finite element dynamic analysis and the consideration of energy balance of the system.

Presented at the 3rd Conference in London, England September 1-5 1975, sponsored by the Committee of the European Communities, EEC.

Ando, Y (Tokyo University, Japan); Yagawa, G Sakai, Y *Internatl Conf on Struct Mech in React Tech, Trans Proceeding* Vol. 5 Pt. L7/1, 1975, 11 pp, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 142537

**FAILURE BY STRESS CORROSION CRACKING-CURRENT APPROACHES TOWARD FAILURE PREDICTION**

Stress corrosion cracking (SCC) produces failures in a material when it is subjected to the combined effects of mechanical stress and reaction with an environment. All proposed mechanisms of SCC seek to explain how the combination of a given level of stress, a particular material, and a given environment can lead to the initiation and propagation of cracks. The three major categories of mechanisms that are generally proposed are (1) active path dissolution, (2) stress-sorption, and (3) embrittlement. From chemistry have come two main currents; (a) increased awareness of the importance of characterizing the altered environment inside a growing crack, and (b) a recognition of the importance of the regrowth rate of a protective film on a bare surface exposed when that film is broken by stress. The main emphasis in the metallurgy of SCC has been on the crucial role played by structure in general, and particularly at the tip of a crack. Aiding this objective has been the use of the high voltage electron microscope which can directly look at the interaction of the environment with structural defects, e.g., dislocations. Finally, major thrust in the mechanics of SCC has been the application of the concepts and techniques of fracture mechanics. The impact of these new concepts and measurement techniques on predicting and preventing SCC failure is discussed.

Presented at the 20th Meeting of the NBS Mechanical Failure Prevention



Group, Gaithersburg, Maryland, May 8-10 1975.  
 Kruger, J  
 National Bureau of Standards Proceeding Spec. Pub. 423, Apr. 1976, pp  
 27-40, 74 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: Society of Naval Architects of Japan, Journal of Technical  
 Analysis Division, Gaithersburg, Maryland, 20760

**09 142538**  
**FAILURE BY FATIGUE**

In the field of fatigue a considerable advance in recent years has been made in the quantitative treatment of the fatigue process, especially with respect to the matter of fatigue crack growth. Improved understanding of the fatigue crack growth process is timely as in certain circumstances, as for example in the case of welded structures, it is not the initiation of cracks but rather the growth of cracks from preexisting defects which is the critical aspect in determining service lifetime. Other advances have been made in improving the resistance of materials to fatigue either through the control of chemistry or by control of processing variables. Such procedures are generally more important in affecting the crack initiation rather than the crack propagation stages. Review of the current status of fatigue is given from the mechanistic as well as the design viewpoints. Areas in need of further understanding such as corrosion fatigue, creep-fatigue, and fatigue under variable amplitude loading are also considered.

Presented at the 20th Meeting of the NBS Mechanical Failures Prevention Group, Gaithersburg, Maryland, May 8-10 1975.

McEvily, AJ (Connecticut University, Storrs)  
 National Bureau of Standards Proceeding Spec. Pub. 423, Apr. 1976, pp  
 13-24, 25 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: National Bureau of Standards Technical Analysis Division,  
 Gaithersburg, Maryland, 20760

**09 142603**  
**SEAMS OF WELDED JOINTS, METHODS OF ULTRASONIC  
 FLAW DETECTION, GOST 14782-69 [Shvy svarnykh  
 soedinenii-metody ul'trazvukovoi defektoskopii]**

This standard covers ultrasonic inspection of welded joints in low-carbon, low-alloy steels; aluminum and its alloys; titanium and its alloys; and lead and its alloys. The process does not cover the basic metal of the welded zone nor the weld metal itself. The inspection is to expose cracks, improper welds, gas inclusions and slag in joints, seams, corners, and T welds assembled by arc welding, electro-slag welding, gas welding, gas-pressure welding and spot welding. It is a standard for production operations. [Russian]

This document is a state standard. Full translation is available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

USSR Council of Ministers No Date, 15 pp, 29 Fig., 1 Tab.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: USSR Council of Ministers State Committee for Standards,  
 Moscow, USSR

**09 142604**  
**RAILROAD RAILS: METHODS OF ULTRASONIC FLAW  
 DETECTION, GOST 18576-73 [Rel'sy zheleznodorozhnye-metody  
 ul'trazvukovoi defektoskopii Gost 18576-73]**

This state standard involves ultrasonic methods for examination of R43, R50, R65 and R75 rails for detection of defects in the head, web and base for pin holes, flakes, blisters, segregations, cracks and welding flaws. The equipment includes pulse ultrasonic detectors with probes operating at an oscillation frequency of 1.5 to 4.0 megahertz and standard gages for measuring and checking main control characteristics to be used for the inspection. Standards for measuring and checking the main control characteristics are also detailed. Test procedures are described for complete rail inspection. [Russian]

This document is a state standard. Full translation is available for reference. Contact Technology Planning Officer, office of Research and Development, Federal Railroad Administration, U.S. DOT.

USSR Council of Ministers No Date, 10 pp, 17 Fig.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: USSR Council of Ministers State Committee for Standards,  
 Moscow, USSR

**09 142934**  
**FINITE ELEMENT ANALYSIS: DEVELOPMENT TOWARD  
 ENGINEERING PRACTICALITY**

Finite element analysis, a brainchild of aircraft stress analysts, has become a more-and-more powerful engineering design tool with the steady progress of computers. From early application to aircraft and civil engineering structures, it is now used on such varied problems as bearing and containing rod design, engine cylinder block stressing, the analysis of inflatable structures and shock absorbers, earthquake engineering and tidal flow analysis. The author reviews the development of the techniques, and indicates some future trends.

Spooner, JB *Chartered Mechanical Engineer* Vol. 23 No. 5, May 1976, 5  
 PP

ACKNOWLEDGMENT: British Railways  
 ORDER FROM: ESL

DOTL JC

**09 143143**  
**PROTECTANT FOR WOOD**

According to the patent application, substances, particularly wood, which are normally subject to deterioration due to marine borers, are preserved by applying to the substance a dibutylbenzylphenol.

This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Jurd, L Bultman, JD  
 Department of Agriculture Pat. Appl. PAT-APPL-675-104, No Date, 8  
 PP

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-254004/5ST, DOTL NTIS

**09 143166**  
**MECHANICAL FAILURES: IMPLICATIONS FOR SCIENCE**

The early scientific advances by Griffith for continuum cracks and by Orowan, Taylor, Hall and Petch, and Hirsch and co-workers for effects of microstructure have contributed to our current understanding of mechanical failure. However, this understanding remains incomplete. Here, a brief historical account and survey of the present status of various fundamental aspects of the failure problem are presented. Specific unsolved problems and areas for needed research are suggested. (Author)

Availability: Pub. in National Bureau of Standards Special Publication 423, Definition of the Problem, Proceedings of the Meeting of the Mechanical Failures Prevention Group (20th) 8-10 May 74, Gaithersburg, Md., p181-191 Apr 76.

Hirth, JP  
 Ohio State University Research Foundation, (NR-036-047) Tech. Rpt.  
 OSURF-4098-13, 1976, 13 pp

Contract N00014-75-C-0541

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

AD-A026436/6ST, DOTL NTIS

**09 144071**  
**MEASUREMENT OF ACOUSTOELASTIC AND THIRD-ORDER  
 ELASTIC CONSTANTS FOR RAIL STEEL**

Measurements of the stress-induced changes in ultrasonic wave speeds in steels typically used in railroad rails are presented. All of the five possible relative changes in wave speeds for a uniaxial state of stress have been determined and agree, to within the limits of accuracy of the measurement, with the second-order theory of Hughes and Kelly. The third-order elastic constants are calculated from the acoustoelastic data.

Egle, DM Bray, DE (Oklahoma University) *Acoustical Society of America, Journal of* Vol. 60 No. 3, Sept. 1976, pp 741-44, 2 Fig., 4 Tab.

ORDER FROM: ESL

DOTL JC, DOTL RP

09 144451

**A METHOD FOR CONDUCTING TESTS OF EXPERIMENTAL RAILS AT THE EXPERIMENTAL TEST LOOP AT STATION SHCHERBINKA, MOSCOW RR** [Metodika provedeniia poligonnykh ispytaniy opytrykh rel'sov na eksperimental'nom kol'ste St. Shcherbinka, Mosk. Zh. D.]

This specification lists the general test standards, the evaluation criteria, and the data processing and methods for drawing conclusions. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

All-Union Labor Red Banner Railway Research Inst No Date, 3 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

09 144455

**COMPARISON OF TWO EVALUATION METHODS OF RESIDUAL STRESS CONDITIONS IN RAILS** [Svravnenie dvukh metodov otsenki ostatochnogo napriazhennogo sostoiانيا rel'sov]

During the periodic determination of the level of residual stresses in rails, the method of longitudinal section of rail samples along the neutral axis of the rail web is used widely on a length of 400 mm, by measuring the slot gapping (or convergence). A more complete information can be obtained using the method of a cut-out of a template, with the subsequent tensile measurement of deformations, which arise during the relieving of the residual stress. The resulting residual stress sheet on the rail surface has a very complex character. In order to determine the maximum value of residual stresses on the head surface, in the web, and in the middle part of the rail flange, a statistical processing of results of residual stresses by both methods was used. It was found that it was not possible to determine with sufficient accuracy the stress magnitudes due to the complex character of distribution of residual stresses according to slot gapping. For an approximate evaluation, one can use the value of gapping (or convergence) of the slot of the rail sample along the web. [Russian]

Performing organization was the All-Union Scientific Research Institute of Railroad Transport (V.N.I.I.). Abstract only is available in English, original untranslated as of December 1976.

Koniukhov, AD Reikhart, VA Kaportsev, VN *Zavodskaiia Laboratoriia* No. 1, 1973, pp 87-89, 3 Fig., 3 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ministerstvo Chernoi Metallurgi SSSR 2-i Obydenski per 14, Moscow G-34, USSR

09 144456

**LABORATORY TESTS OF REINFORCED CONCRETE TIES (SECTION I)** [Laboratornye ispytaniia zhelezobetonnykh shpal (Razdel i)]

Testing of concrete ties has attempted to verify design assumptions, utilizing both new and used ties. Among the factors studied: Loads producing cracks, loads destroying ties; characteristics and dimensions of permanent deformation of the tie and elastic deformations and stresses of ties. Testing includes simulation of the ballast under the tie base, and the application of static and pulsating loads. Determinations of fatigue life and bending moment are explained. [Russian]

Published as part of the collection "Improvements in Reinforced Concrete", *Usovershenstvo nani zhelezobetonnykh shpal*, proceedings of Ts, N.I.I., MPS, No. 257. Complete translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

All-Union Labor Red Banner Railway Research Inst 1963, pp 41-52, 6 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

09 144460

**INSTRUMENTED INSPECTION OF RAILROAD RAIL QUALITIES** [Instrumental'nyi kontrol kahestva zheleznodorozhnykh rel'sov]

This proceedings includes the following reports: The effect of metallurgical defects on the reliability of rails; On the effect of operational factors on removal of individual rails as affected by manufacturing defects; Ultrasonic inspection of the micro-and macro-structure of rail metal; Inspection of the depth of the surface hardened zone of rail; The effect of rail steel composition on its magnetic properties; Factory testing of a magnetic hardness tester; Nondestructive testing of hardened stock rail; Magnetic testing of the qualities of surface-hardened switch points; Modernization of facility for continuous testing of rail hardness; Automatic devices for testing curvature of rails; Magnetic testing of end distortion of rails; Method of detecting surface defects on rail flanges; Testing qualities of rail metal at French steel mills; Instrumented methods of evaluating the impact strength of rails; Testing rails by measuring deformation and destruction; Research on rail testing towers. [Russian]

Table of Contents only is available in English, original untranslated as of December 1976.

All-Union Labor Red Banner Railway Research Inst 1974, 111 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

09 144473

**PROPERTIES OF VOLUME HARDENED RAILS (WITH HARDNESS ON THE ORDER OF 331 TO 388 BRINNEL UNITS), USED ON USSR RAILROADS** [Svoistva ob'emno-zakalennykh rel'sav (s tverdst'iu poriadka 331-388 edinits po brinelliu), ispol'zuemykh na zheleznykh dorogakh SSSR]

Quench hardening of rails is the most important measure used in USSR for increasing the efficiency of railroad tracks. The creation of the optimum microstructure of the carrying part of the rail is the determining factor. Uniform hardness is the only durability parameter which can be determined under production conditions. Methods of testing mechanical properties under stretching of samples, resistance to wear, resistance to cleavage fracture, fatigue strength, and residual stresses are discussed. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

All-Union Labor Red Banner Railway Research Inst 1976, 10 pp, 7 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

09 144474

**OPEN-HEARTH STEEL RAILS OF R75 AND R65 TYPES FOR WIDE-GAUGE RAILWAYS. TECHNICAL REQUIREMENTS.**

**GOST 8160-63** [Rel'sy zheleznodorozhnye shirokoi kolei tipov P75 i P65 iz martenovskoi stali, tekhnicheskie trebovaniia GOST 8160-63]

The Standard deals with R75 and R65 wide-gauge rails, made from open-hearth, fully-killed steel. Rails of the R65 type with stepped-up strength, from alloy carbon steel and hardening on the whole length, are produced according to special technical conditions. The chemical composition of steel is indicated in the Table. Technical specifications describe mechanical, physical and chemical requirements of both types of rails. In the first sort are included rails conforming to the requirements of this standard. To second sort belong rails which have several divergencies: in chemical composition, in temporary resistance during stretching, in bending deflection, and in dimensions exceeding admissible deflections, indicated in corresponding GOSTs; finally, according to fine cracks, not exceeding a depth of 3 mm, and 1 mm in the middle third of the rail flange. Testing and marking procedures are described. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Council of Ministers 1972, 11 pp, 1 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Council of Ministers State Committee for Standards, Moscow, USSR

09 144475

**RAILROAD RAILS OF THE R50 AND R65 TYPES FOR WIDE-GAUGE RAILWAYS, THERMALLY TREATED BY WAY OF VOLUMETRIC OIL HARDENING. TECHNICAL REQUIREMENTS, GOST 18267-72. OFFICIAL PUBLICATION [Rel'sy zheleznodorozhnye tipov P50 i P65 širokoi kolei, termoobrabotannye putem ob'emhoi zakalki v masle. Tekhnicheskie trebovaniia GOST 18267-72. Izdanie ofitsial'noe]**

The Standard deals with R50 and R65 types of wide-gauge rails, produced from open-hearth, high-carbon steel. Thermally-treated rails have to conform to requirements of GOST-s 6944-63; 7174-65; 8160-63; and 9160-63, and also to chemical composition indicated in the Table of this Standard. Mechanical specifications of steel are presented in a Table, and concern hardness, provisional resistance, yield-point, relative extension and contraction, and impact strength. Hardness on the rolling surface of the rail head should be NV331 to 388, hardness of the web and flange of the rail-not over NV388. Hardened rails have to undergo acceptance inspection and tests. Chemical composition is tested according to GOST 2331-63. Sampling for chemical tests is made according to GOST 7565-66. Hardness on the rolling head surface and on the rail cross-section is determined according to GOST 9012-59. [Russian]

Abstract only is available in English, original untranslated as of December 1976.

USSR Council of Ministers 1972, 8 pp, 1 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Council of Ministers State Committee for Standards, Moscow, USSR

09 147585

**EVALUATION OF JAPANESE RAIL RECEIVED FROM THE NORFOLK AND WESTERN RAILROAD**

The Association of American Railroads obtained samples of 136 lb/yd rail produced by the Nippon Steel Company to ARA specifications from the Norfolk and Western Railroad Company as part of its ongoing evaluation of domestic and foreign rail. This rail is of particular interest in view of the unconventional double heat rolling system used during its fabrication to obtain low residual hydrogen levels without control cooling the finished rail. Data gathered during an extensive metallurgical investigation showed that this material meets all existing ARA specifications and compares favorably with previously tested rail in regards to both metallurgical and physical properties.

Leadley, GL Fleming, LD

Association of American Railroads Technical Center, (Project No. R-082) Test Rpt. R-240, July 1976, 22 pp, 8 Fig., 5 Tab.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

09 147716

**EVALUATION OF TRACTION MOTOR GEAR CASE BOLTS**

Illinois Central Gulf Train No. 753 was involved in a derailment on January 16, 1976, due to a cracked gear case bolt. This bolt was one of 14 to have failed during 1975-1976. The ICG requested a higher grade bolt from the manufacturer and then asked the Technical Center to evaluate the two bolts. Tests of the two bolts show the old bolts to be made of plain carbon 1040 grade steel, and the new bolts to be a Cr-Mo 4140 grade steel. The new bolts exhibit superior strength and fracture toughness to the extent that the 4140 grade bolt should not fracture in a brittle mode above-10F. Therefore, it would appear that bolts made from the grade 4140 steel are suitable for this application.

Stone, DH

Association of American Railroads Technical Center, (Project R-089) Res. Rpt. R-233, Aug. 1976, 17 pp, 5 Fig., 2 Tab.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

09 147829

**PAST 50-YEAR DEVELOPMENT OF CONSTRUCTION STEELS**

A number of significant advances have been made during the past 50 years in the technology of steels for constructional applications. Carbon steels have been developed with improved strength, toughness, and weldability. Economical high-strength low-alloy steels are now available with yield strengths in the range of about 42,000 psi to 65,000 psi (290,000 kN/sq. m to 449,000 kN/sq. m). Steels with superior atmospheric corrosion resistance have been successfully used in the bare (unpainted) condition in major structures. Heat-treated constructional alloy steels have been developed for applications where yield strengths on the order of 100,000 psi (690,000 kN/sq. m) are desired. Specialty alloy steels have been developed for applications which require superior combinations of strength and toughness. Careful consideration must be given to selection of steels for a particular application because of the wide range of mechanical properties and metallurgical characteristics now available for structural steels.

Webb, RD *ASCE Journal of the Construction Division* Vol. 101 No. C04, Dec. 1975, pp 785-800

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

09 147830

**PULL-OUT MECHANISM IN STEEL FIBRE-REINFORCED CONCRETE**

The bond between steel fibers and portland cement matrices is a critical factor in determining the strength properties of fiber-reinforced concrete structural elements. The influence of the following three major parameters on the pull-out behaviour of fibers was studied: the angle of orientation of the fibers with the loading direction, the number of fibers being simultaneously pulled out from the same area, and the efficiency of random orientation. It is shown that: (1) The pull-out load of a randomly oriented fiber is not lower than that of an aligned fiber; (2) the pull-out capacity of a group of randomly oriented fibers decreases drastically when the number of fibers pulling out from the same area increases; and (3) the efficiency of fiber orientation after matrix cracking is substantially higher than efficiency factors derived from the theoretical elastic considerations. These results seem to explain why the addition to a concrete matrix of fibers with highly improved bond properties does not often lead to an equivalent improvement in the composite properties.

Naaman, AE Shar, SR *ASCE Journal of the Structural Division* Vol. 102 No. STB, Aug. 1976, pp 1537-48

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

09 147894

**PORTEC CENTER WEDS COMPUTER SCIENCE TO MECHANICAL TESTING**

The John S. Newton Research Center of Portec, Inc., in Oak Brook, Ill., aims at developing a stronger, safer, more efficient and more economical track structure while taking into consideration the dynamic interaction between trains and track. Capabilities include accelerated fatigue testing the means of studying the effects of high-frequency vibration on track structures and their components. While containing a wide range of advanced mechanical testing equipment, the center also has electronic equipment representing the latest in computer science. A precise understanding of what happens in the track structure under load must replace the experience and opinion on which existing track component designs are based.

Dick, MH *Railway Age* Vol. 177 No. N22, Dec. 1976, pp 18-20, 4 Phot.

ORDER FROM: ESL

DOTL JC

09 147895

**THE ROLE OF FRACTURE MECHANICS IN DESIGN TECHNOLOGY**

Fracture mechanics has in recent years become an independent discipline that deals with determining the conditions under which machine or structural elements attain uncontrollable failure by crack propagation. A knowledge of these conditions can assist the designer to safeguard structures

against catastrophic fracture. In contrast to the conventional approach, which does not account for flaws initiated in the material by manufacturing procedures, overloads, or fatigue loadings, fracture mechanics assumes that all materials contain cracks from which failure starts. This concept has been used successfully for high-strength/low-toughness materials design and for structures that exhibit brittle behavior. Obtained from laboratory specimens loaded symmetrically with respect to the crack plane is a critical stress intensity factor parameter  $k_{Ic}$ . It is a characteristic of the material commonly referred to as the fracture toughness value. When machine elements are subjected to combined loading, where symmetry does not exist, the direction of crack initiation is no longer known a priori. The condition of crack instability can then be predicted from the strain energy density factor  $S$ . Numerous numerical examples involving press fit, rotating

disk, thermally stressed pipe, pressure vessel, etc., are presented to show how fracture mechanics can be used for estimating the load that a member can sustain without causing unstable fracture. The results are compared with those obtained from the conventional design approach whenever possible.

Contributed by the Design Technology Transfer Committee of the Design Engineering Division and presented at the Design Engineering Technical Conference, Montreal, Canada, September 26-29, 1976.

Sih, GC (Lehigh University) *ASME Transactions* Vol. 98 No. 4, Nov. 1976, pp 1243-49, 9 Fig., 13 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL JC



10 052998

**NOISE ABATEMENT ON DIESEL LOCOMOTIVES. THE DIESEL ENGINE AS A SOURCE OF NOISE. NOISE RADIATING ZONES OF A DIESEL ENGINE BEFORE AND AFTER ITS FUNDAMENTAL OVERHAUL**

In the present report an attempt is made, first of all, on the basis of the fundamental technical data of a diesel engine, to give a calculable evaluation of the noise level to be expected. The report is concerned moreover with some acoustic component questions, which were investigated at the testing station, on a diesel traction engine of the DB (Maybach MD 650/1B No: 112407, constructed in 1960, 12 cylinder, super-charged, 1500 r.p.m., 1200 HP/880 kW): Dependence of the intake and exhaust noise, on the r.p.m. of the engine and on the engine output; Dependence of the engine noise level and engine noise spectrum, on the r.p.m. of the engine and on the engine output; Dependence of the noise level and noise spectrum recorded in the vicinity of the engine, on the r.p.m. of the engine and on the engine output; Dependence of the body conduction sounds measured at various positions on the engine surface, on the r.p.m. of the engine and on the engine output; Research into the positions or parts of the engine with the greatest noise level; Dependence of the development of engine noise on the length of service; and discussion of the possibilities of noise reduction by drawing on measuring results of other authors.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B104/RP 2/E, Apr. 1968, 29 pp, 73 Fig., 9 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

10 052999

**NOISE ABATEMENT ON DIESEL LOCOMOTIVES. THE DIESEL ENGINE AS A NOISE SOURCE. INVESTIGATION INTO THE NOISE PRODUCED BY VARIOUS MECHANICAL MOVING PARTS**

The noise produced by a diesel is due partly to the moving mechanical parts and partly to combustion and its mechanical effects. The tests described in the report are mainly concerned with the noise produced by the various constituent parts of the engine in the absence of combustion. The engine used was a 16-cylinder supercharged 4-stroke diesel V-form engine with direct injection and a rated output of 1,030 kW (1,400 hp) at a speed of 1,500 rpm; it was driven by its main generator functioning as a motor. The sound measurements, taken with the various parts working separately, enabled the part played by each in the overall noise to be evaluated. The results of these measurements show that the sound energy radiated by the different mechanical moving parts increases considerably with the speed of the engine. In the prevailing test conditions, the overall noise at the nominal rating of 1,500 rpm was as high as 98 dB (A), by far the greater part of which was due to the piston and connecting rod assemblies (94 dB (A)); on the other hand, the overall noise level drops sharply (80.5 dB (A)) when the engine is idling (550 rpm), and then the noise of the injector pumps, although reduced from 86.5 to 78.5 dB (A), becomes predominant, that of the piston and connecting rod assemblies dropping to 71.5 dB (A). The results of these tests indicate that any effort to reduce the noise produced by the mechanical components should be focussed first on the piston and connecting rod assemblies, then on the injection system and lubricating-oil pumps. The supplementary tests have shown that, at nominal rating, the combustion would produce a noise of the same order as that recorded for the individual piston and connecting rod assemblies, and somewhat quieter than that of the complete motored engine.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B104/RP 3/E, Apr. 1968, 27 pp, 50 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

10 053001

**NOISE ABATEMENT ON DIESEL LOCOMOTIVES. THE DIESEL ENGINE AS A SOURCE OF NOISE**

Following measurements taken on diesel engines and analysed in Report Nos. 2 and 3, an attempt has been made at reducing the noise caused by

diesel engines by a treatment of the parts found to be the noisiest ones, such as injector pumps, cylinder caps, inspection covers and air intake collectors. The advantages obtained from each of the improvements effected are discussed in Part 2. The injector pumps have been dealt with separately and form the subject of Part 1. In Part 3, the noise measured at 8 points on an MGO engine is compared to that caused by a PA 4 engine. Finally, in the fourth part an attempt has been made at explaining the differences between the noise caused by the three engines and a comparison has been made between the acoustic output and efficiency and between the constructional differences.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B104/RP 5/E, Apr. 1971, 32 pp, 51 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

10 053002

**NOISE ABATEMENT ON DIESEL LOCOMOTIVES. NOISE MEASUREMENTS TAKEN AT LOCOMOTIVE FANS; NOISE-REDUCTION PROPOSALS BASED THEREON**

This report covers noise measurements taken at the fans of: 10 diesel locomotives belonging to 5 different Administrations, 21 electric locomotives belonging to 7 different Administrations. It shows that in many cases the fans are responsible for most of the noise produced by the locomotive, and that it is worth taking steps to reduce the fan noise. This report represents the practical application of the theory described in report B 104/RP 4, published in April 1969, and in document DT 10, published in August 1968. On the basis of the acoustic power levels calculated from the characteristic data of various fans (driving power and air delivery rate), theoretical values and measured results were compared. This enabled statements to be made on the extent to which theory and practice agreed.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B104/RP 6/E, Apr. 1972, 18 pp, 7 Fig., 4 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

10 053209

**ENVIRONMENTAL POLLUTION BY THE RAILWAYS. PROBLEMS ENCOUNTERED BY THE RAILWAY ADMINISTRATIONS IN THE FIELD OF ENVIRONMENTAL POLLUTION**

General outlook on the main aspects of the problem of environmental pollution. Assessment of the replies supplied by 27 administrations to an enquiry, asking which problems of environmental pollution by the railways are considered worth investigating on the international level. Summing up of similar problems confronting the American Railways. Conclusions, confirming the importance of obtaining full information about studies being performed on the subject and suggesting that ORE should launch an investigation on three of the problems proposed.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. C143/RP 1/E, Apr. 1976, 72 pp, 2 Fig., 22 Tab.

ACKNOWLEDGMENT: UIC  
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10 053210

**RAILWAY NOISE. MEASUREMENT OF WHEEL/RAIL NOISE ON A ROLLER STAND: NOISE GENERATED BY VARIOUS BOGIE ELEMENTS AND ACOUSTIC INFLUENCE OF THE SIDE-SKIRTING OF THE VEHICLE BODY**

This report indicates the share taken by various components of one each of earlier and modern types of Y 10 and Y 28 F bogies in the sound energy radiated to the environment. The basic results of the tests concerning the rolling noise were obtained from driving the axles concerned on a rolling rig.

Under identical measurement conditions, the improvement obtain from the side-skirting of the vehicle body has been determined at varying levels above the running plane.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways C137/RP 3/E, Apr. 1976, 16 pp, 17 Fig., 5 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

10 093918

**EVALUATION OF DIESEL ENGINE PERFORMANCE WITH INTAKE AND EXHAUST SYSTEM THROTTLING. VOLUME I: TEXT AND APPENDIXES A THROUGH H**

The diesel engine itself is an important source of diesel powered vehicle noise, and becomes dominant after proper treatment of intake/exhaust and cooling system noise at vehicle speeds below fifty miles per hour. An investigation is reported, in two volumes, to quantify the effects of intake and exhaust restrictions, and load-speed scheduling on the radiated noise from four diesel truck engines, produced by different manufacturers. Sound power measurements were made in an acoustically modified engine performance test cell. The noise associated with intake, exhaust, cooling and their respective ducting systems were appropriately abated to permit quantification of engine radiated noise. Exhaust emission data including temperature and performance data were also monitored. Portions of this document are not fully legible.

See also Volume 2, PB-247 753.

Hern, R Eccleston, B Marshall, W  
Bartlesville Energy Research Center, Transportation Systems Center Final Rpt. DOT-TSC-OST-74-42.I, Nov. 1975, 148 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS Repr. PC, Microfiche

PB-247752/9ST

10 133222

**BART IMPACT PROGRAM. IMPACTS OF BART ON THE NATURAL ENVIRONMENT; INTERIM SERVICE FINDINGS**

The report documents the study done on the impacts of BART on the natural environment. The general subject area is divided into three categories which define its limits and organize its many aspects. The categories are: (a) Biota (Wildlife and Vegetation) (b) Soils and Geology, and (c) Drainage and Water Systems. Since almost the entire area traversed by BART is urbanized and fully developed, this natural environment was not a major topic of study. However, a comprehensive review of BART's possible impacts was performed because impacts on the natural environment are often not apparent even when they are quite significant from an ecological point of view.

Sponsored in part by Department of Housing and Urban Development, Washington, D.C. Prepared by DeLeuw, Cather and Co.

Department of Transportation, Department of Housing and Urban Development, De Leuw, Cather and Company Tech. Memo MTC-TM-17-4-76, Mar. 1976, 99 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-251571/6ST, DOTL NTIS

10 133286

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. TRANSPORTATION PLANNING AND ENVIRONMENTAL**

The project was designed to develop a revised and updated series of handbooks covering various aspects of the design, construction, and equipment of a modern rail rapid transit system.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PC\$70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-

09-0014-TS-C) Final Rpt. UMTA-IT-09-0014-75-1, Mar. 1975, 196 pp  
ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-251642/5ST, DOTL NTIS

10 133304

**UNDERPLATFORM EXHAUST TESTS IN THE TORONTO SUBWAY**

The technical report has been prepared under the Transit Development Corporation (TDC) project 'Ventilation and Environmental Control in Subway Rapid Transit Systems.' The underplatform exhaust system is a subway environmental control feature designed to remove train generated heat within the confines of stations and thereby improve environmental conditions. To evaluate the performance of this system, a full-scale test facility was constructed in a station of the Toronto subway. This report describes the facility design and the experimental program. A presentation of test results and interpretations is included, leading to the development of a quantitative design versus performance relationship for use by subway environmental engineers.

Prepared by Parsons, Brinckerhoff, Quade and Douglas, Inc., New York, DeLeuw, Cather and Co., New York, and Kaiser Engineers, Los Angeles, Calif.

Transit Development Corporation, Incorporated, Urban Mass Transportation Administration, Parsons, Brinckerhoff, Quade and Douglas, Inc, De Leuw, Cather and Company, Kaiser Engineers Tech. Rpt. UMTA-DC-06-0010-75-5, 203 pp

Contract DOT-UT-290

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-251728/2ST, DOTL NTIS

10 137328

**SUBWAY ENVIRONMENTAL DESIGN HANDBOOK**

No abstract available.

Set includes PB-254788 thru PB-254790.

Transit Development Corporation, Incorporated 3 Volumes, Mar. 1976

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254787-SET/ST, DOTL NTIS

10 137329

**SUBWAY ENVIRONMENTAL DESIGN HANDBOOK. VOLUME I. PRINCIPLES AND APPLICATIONS. SECOND EDITION**

This handbook is a guide and reference for the planning, design, construction and operation of environmental control systems for underground rapid transit. The handbook follows the engineering sequence from criteria through load analysis, and from system conceptual design to selection of equipment. It covers a broad range of parameters, including temperature, humidity, air quality and rapid pressure change, and, to a limited extent, noise and vibration as related to environmental control equipment. The content of the handbook is divided into two volumes, Volume I (this volume), Principles and Applications, encompasses all of the above subject matter so that much of the environmental system design can be accomplished using the techniques, computations and related graphic data contained therein.

Also available in set of 3 reports as PB-254 787-SET, PC\$97.00/MF\$4.75.

Transit Development Corporation, Incorporated, Urban Mass Transportation Administration Tech. Rpt. UMTA-DC-06-0010-76-1, Oct. 1975, 408 pp

Contract DOT-UT-290

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254788/3ST, DOTL NTIS

10 137330

**SUBWAY ENVIRONMENTAL DESIGN HANDBOOK. VOLUME II. SUBWAY ENVIRONMENT SIMULATION COMPUTER PROGRAM (SES). PART 1. USER'S MANUAL**

This document forms part of the Subway Environmental Design Handbook. It contains the background information and instructions to enable an



engineer to perform an analysis of a subway system by using the Subway Environment Simulation (SES) computer program. The SES program is a designer-oriented tool which provides estimates of the airflow, temperature, and humidity characteristics, as well as the air-conditioning requirements, for both operating and proposed multiple-track subway systems of any given design and operating characteristics. The SES program can be used to evaluate the impact on the subway environment of alternative subway system design parameters such as tunnel and station cross-sectional area and length, tunnel interconnections, location and size of ventilation shafts and passenger entrances, ventilation fans, train headway and operating speed, and other parameters. The SES program is a numerical simulation model which incorporates the results of theoretical research, scale-model tests and field tests, and has been verified through comparisons with measurements taken in operating subway systems.

Also available in set of 3 reports as PB-254 787-SET, PC\$97.00/MF\$4.75.

Transit Development Corporation, Incorporated, Urban Mass Transportation Administration Tech. Rpt. UMTA-DC-060010-75-1, Oct. 1975, 1514 pp

Contract DOT-UT-290

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254789/1ST, DOTL NTIS

**10 137331**  
**SUBWAY ENVIRONMENTAL DESIGN HANDBOOK. VOLUME II. SUBWAY ENVIRONMENT SIMULATION COMPUTER PROGRAM (SES). PART 2. PROGRAMMER'S MANUAL**

The Subway Environment Simulation Computer Program (SES) is a product of a four-year research and development project in the area of subway environmental control sponsored by the U.S. Department of Transportation's Urban Mass Transportation Administration and the Transit Development Corporation, Inc. The project produced a two-volume Subway Environmental Design Handbook. Volume 2 consists of two separate documents: Part 1, the SES User's Manual, and Part 2, the SES Programmer's Manual. The Programmer's Manual is intended to assist computer department personnel in making the SES Program operational on a given computer and to aid a programmer needing to understand the details of the internal operation and sequencing of the program. The information contained herein is not intended for design engineers and will be of no assistance to those wanting to use the program as it stands; all information necessary for application of the program is provided in the User's Manual. Portions of this document are not fully legible.

Also available in set of 3 reports as PB-254 787-SET, PC\$97.00/MF\$4.75.

Transit Development Corporation, Incorporated, Urban Mass Transportation Administration Tech. Rpt. UMTA-DC-060010752, Oct. 1975, 1256 pp

Contract DOT-UT-290

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254790/9ST

**10 137365**  
**ACOUSTIC IMPACTS OF BART: INTERIM SERVICE FINDINGS**

The report documents the findings and methodologies developed during a study of BART sound and vibration levels. The findings focus on: delineation of impacted regions, major factors affecting BART-generated sound, prototype vs. operational sound levels, BART vs. other transportation sound sources and BART-generated vibration levels. BART-generated sound levels were derived from direct wayside measurements and indirectly from on-board recording of sound levels throughout the BART system. Ambient community sound levels were based on predictive techniques verified by field measurements.

Prepared by Bolt, Beranek and Newman, Inc., Cambridge, Mass.

Metropolitan Transportation Commission, Department of Transportation, Department of Housing and Urban Development, Bolt, Beranek and Newman, Incorporated Tech. Memo MTC-TM-16-4-76, Mar. 1976, 93 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB254966/5ST, DOTL NTIS

**10 138076**  
**A METHOD OF ASSESSING THE NOISE NUISANCE ARISING FROM THE CHANNEL TUNNEL HIGH SPEED RAIL SYSTEM**  
No Abstract.

Richards, EJ *Journal of Sound and Vibration* Vol. 43 N Dec. 1975, pp 633-657, 11 Fig., 25 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

**10 139442**  
**THE COLLECTED SPEECHES OF JAMES R. COXEY. 1972-1975**  
No Abstract.

Association of American Railroads No Date, 155 pp

ACKNOWLEDGMENT: AAR  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

**10 139453**  
**LOCOMOTIVE MUFFLER FEASIBILITY STUDY**

As a result of joint discussions between the Association of American Railroads (AAR) and Donaldson Co., Inc., (Donaldson) an agreement was made in which Donaldson would perform a "Feasibility Study Toward Development of a Locomotive Muffler Prototype". The study was to determine the effectiveness of an exhaust muffler in reducing the overall total locomotive noise levels when measured 100 feet away from and perpendicular to the locomotive. If determined feasible, further action would be to develop a muffler prototype that could be installed within the carbody that would provide a specified degree of attenuation of the exhaust noise of the locomotive. To meet this objective it was necessary to select two representative locomotive models (turbocharged and Roots-blown) and test them with a high attenuation external muffler for the purpose of determining the reduction in total locomotive noise when the exhaust noise is effectively attenuated to an insignificant level. The remaining noise measured at 100 feet would then be the total contribution of the other noise sources on the locomotives, such as, engine cooling fans, engine air intake, car body noise, etc. The results of this feasibility study are the subject of this report.

Donaldson Company, Incorporated Sept. 1975, 38 pp, 25 Fig.

ACKNOWLEDGMENT: AAR  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

**10 139493**  
**WHEEL/RAIL NOISE, PARTS I-V**

Part I-Characterization of the wheel/rail dynamic system; P.J. Remington; Part II-Wheel squeal; M.J. Rudd; Part III -Impact noise generation by wheel and rail discontinuities; I.L. Ver, et al; Part IV-Rolling noise, P.J. Remington; Part V-Measurement of wheel and rail roughness; A.G. Galaitis and E.K. Bender.

*Journal of Sound and Vibration* Vol. 46 No. 3, June 1976, pp 357-452, 70 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

**10 139509**  
**MODELS FOR COMBUSTION AND FORMATION OF NITRIC OXIDE AND SOOT IN DIRECT INJECTION DIESEL ENGINES**

A mathematical model for predicting heat release rate and emission concentration in diesel engines was developed. In the model, emphasis was placed on the detailed physical processes in the combustion chamber and in employing a minimum of necessary approximations. The ability of the model to predict realistic correlations between engine design and performance



parameter was demonstrated. The model is regarded as a potentially useful tool for evaluating approaches for control of exhaust emission.

Hiroyasu, H (Hiroshima University); Hadota, T  
Society of Automotive Engineers Preprint No. 760129, 1976, 14 pp, 30 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 10 139530 RAIL AND ENVIRONMENT

Summary of the reports drawn up by a Working Party within the UIC Economics Committee to try and give an overall view of the problems of environmental planning in the countries in which the nine European Railways belonging to the Working Party operate (BR, CFF, DB, JZ, NS, OBB, RENFE, SJ, SNCF), together with information on the role these Railways play in the general planning process.

Bot, A *Rail International* No. 6, June 1976, pp 343-350, 8 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

#### 10 139537 MEASUREMENTS OF RAILROAD NOISE--LINE OPERATIONS, YARD BOUNDARIES, AND RETARDERS

A field investigation of noise emission from railroad operations was conducted. The objectives of the study were the establishment of a data base on the noise levels associated with railroad operations, both line (trains in transit) and yard, and the development of measurement procedures that could be utilized in regulations applicable to the noise from rail carrier equipment and facilities. For trains in transit, measurements were made as a function of horizontal distance from the tracks (five locations at 25, 50, 100, 200 and 400 feet) and as a function of microphone height (three different heights at the 25 and 50 foot microphone locations). Train passby data are presented as the maximum A-weighted sound level observed during the passby and as Single Event Noise Exposure Levels (both A-weighted and one-third octave band levels). A-weighted sound level measurements were made at the boundary of the railyard, at 0.1 second intervals, for periods of time ranging from 1 to 23 hours over several days. These data are presented as the energy equivalent sound level and the level exceeded ten percent of the time. The directionality of retarder noise was also investigated. Measurements were made of the noise emitted in various directions during retarder operation.

Fath, JM Blomquist, DS Heinen, JM Tarica, M  
National Bureau of Standards, (NBSIR74-488) Final Rpt. EPA-550/9-74-007, Dec. 1974, 104 pp

ACKNOWLEDGMENT: National Bureau of Standards  
ORDER FROM: National Bureau of Standards Applied Acoustics Section, Mechanics Division, Washington, D.C., 20460 Environmental Protection Agency Office of Noise Abatement and Control, Washington, D.C., 20460

DOTL RP

#### 10 139663 MOBILE SOURCE EMISSION FACTORS: STATE OF THE ART AND FUTURE PROGRAMS

Ambient air quality modeling of carbon monoxide is dependent on accurate mobile source emission factors. The paper examines the sensitivity of emission factor projections to input parameters such as ambient temperature, hot-cold sighting, average route speed, vehicle deterioration, and growth rate. The ability to estimate cold vehicle operation at low ambient temperature is as important to localized emission prediction as is the estimation of growth rates and emissions from future emission control technology vehicles. Analysis of existing data indicates that localized emission factors are needed since projected reductions in emissions from base-line levels are not independent of vehicle operating mode. Present emission factors and planned refinements to EPA Publication AP-42 are discussed. /Author/

Presented at the Conference on the State of the Art of Assessing Transportation-Related Air Quality Impacts, Washington, D.C. October 22-24, 1975.

Williams, ME (Environmental Protection Agency) *Transportation Research Board Special Reports* No. 167, 1976, pp 176-189, 8 Tab., 4 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

#### 10 139944 "THE QUIET ONE," BURLINGTON NORTHERN'S NORTHTOWN YARD, MINNEAPOLIS, MINNESOTA

Burlington Northern has applied extensive noise abatement techniques for the retarders in its Northtown Yard at Minneapolis, Minn. Methods tested or used at other BN yards and on other railroads were adopted. The control of wheel screech noise by vertical sound barriers, sand damping of retarder members, wheel damping and application of water and/or lubricants on wheels and retarder shoes is discussed.

Presented at the 75th Technical Conference, AREA, Chicago, Illinois, 22-24 March 1976.

Walker, MB (Burlington Northern, Incorporated)  
American Railway Engineering Association Proceeding Vol. 77 Bulletin 658, 1976, pp 555-561

ORDER FROM: ESL

DOTL JC

#### 10 141274 PREDICTION OF WAYSIDE RAILROAD NOISE

The recent trends in the revitalization of rail transport in this country have resulted in increased interest in the use of rail rapid transit systems in our cities and high-speed surface rail links between major population centers. Included in the technology assessment of new and improved rail service will be the associated environmental problems, including potentially serious wayside noise problems. The solution to the railroad noise problem requires a valid technique for prediction of wayside noise to assess the benefit of various noise control strategies. This paper describes a graphic method for use when the geometry is rather simple and a computer program for use in situations when track and terrain geometry are complicated.

Hanson, CE Wittig, LE (Bolt, Beranek and Newman, Incorporated)  
*Transportation Research Record* No. 580, 1976, pp 36-41, 5 Fig., 11 Ref.

ORDER FROM: TRB Publications Off

#### 10 141408 INCORPORATING ECONOMIC CONSIDERATIONS IN THE PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS

This paper sets forth a practical, systematic approach to incorporating economic analysis into the preparation of environmental impact statements. Although the guidelines presented are not intended to be all-encompassing, taking explicit account of economic effects according to the approach suggested will lead to more complete environmental impact statements than are now executed and will provide meaningful insights into the effects of specific projects. The first portion of the paper is devoted to a discussion of the general questions that must be addressed in choosing an acceptable set of indicators of economic impact. How other people would be affected by the highway improvement is considered to be a better criterion for judging impact than how much better off or worse off the road use would be. Other general questions addressed are the incidence of effects and welfare versus redistribution effects. The other major portions of the paper consist of a discussion of appropriate indicators and the corresponding formulas for them. Care has been taken to include only indicators and formulas for which the necessary data are easily accessible.

Prepared for the 54th Annual Meeting of the TRB held in Washington, D.C.

Allen, GR (Virginia Highway & Transportation Research Council)  
*Transportation Research Record* Conf Paper No. 583, 1976, pp 55-70, 2 Fig., 31 Ref.

ORDER FROM: TRB Publications Off

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#### 10 141497 PREDICTION OF ENVIRONMENTAL NOISE FROM FAST ELECTRIC TRAINS

A model is presented for the environmental noise of fast electric trains on continuous welded rails, based on a consideration of the possible modes of

vibration of the wheels. Evidence is presented to support the idea that the wheels are the dominant sources of noise and radiate as resonant dipoles. The model is calibrated by the results of measurements and methods of predicting train noise level and noise energy (per unit area) are developed. The noise intensity is found to increase as the fourth power of the speed. Energy (per unit area) at an observer increases as the third power of the speed and is proportional to train length divided by the distance of the observer from the track. The relevance of the model as a basis for the calculation of train noise in terms of some noise indices is then discussed and it is shown that it can be used to predict the parameters required by some indices which may be relevant to the subjective effects of environmental train noise (A) /TRRL/

Cato, DH (Building Research Station) *Journal of Sound and Vibration* Vol. 46 No. 4, June 1976, pp 483-500, 15 Fig., 2 Tab., 24 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220949)

ORDER FROM: ESL

DOTL JC

#### 10 141498

##### CRITERIA AND LIMITS FOR WAYSIDE NOISE FROM TRAINS

Existing knowledge on speech interference, community annoyance, hearing hazard and sleep disturbance is reviewed in order to suggest criteria for the wayside noise from trains, it being borne in mind that the sound is intermittent and its points of reception may be indoors or outdoors. Criteria in terms of energy equivalent sound level are suggested for speech interference, community annoyance and hearing hazard. No authoritative criterion for sleep disturbance was found. Limits recommended by other authorities are summarized, and there is a worked example assessing the impact of a new urban rail system.(a) /TRRL/

May, DN (Ontario Ministry of Transportation & Communic, Can) *Journal of Sound and Vibration* Vol. 46 No. 4, June 1976, pp 537-50, 3 Fig., 3 Tab., 36 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 20950)

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DOTL JC

#### 10 141502

##### WHEEL/RAIL NOISE-PART 1: CHARACTERIZATION OF THE WHEEL/RAIL DYNAMIC SYSTEM

Field and laboratory measurements of the point impedance, response, radiation efficiency, and directivity of rapid transit steel wheels and rails are presented and compared with appropriate analytical models. The rail impedance can be well modeled by the impedance of an infinitely long beam with the same bending stiffness. Measurements of the wheel impedance in the radial direction are closely approximated (up to about 1000 hz) by the impedance of a mass equivalent to that of the wheel plus one-third of the axle mass. Above 100 hz, the wheel impedance is approximated by the impedance of an infinite beam with the same cross-section as the wheel tread without the web. At low frequencies (below 1000 hz), the decay of vibration along the length of a rail away from the point of excitation is rapid enough so that most rail vibration occurs within a few feet of the exciting wheel. Measurements of the wheel radiation efficiency agree with predictions that are based on the radiation efficiency of a rigid disk with the same radius vibrating in the axial direction. The directivity of radiation from the wheel and rail is approximately uniform. /TRRL/

Remington, PJ (Bolt, Beranek and Newman, Incorporated) *Journal of Sound and Vibration* Vol. 46 No. 3, June 1976, pp 359-370, 17 Fig., 2 Tab., 7 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220736)

ORDER FROM: ESL

DOTL JC

#### 10 141503

##### WHEEL/RAIL NOISE-PART 2: WHEEL SQUEAL

A model is presented for the intense pure-tone noise generated by American subway cars and German trams when traversing tight curves. Squeal is presumed to arise from lateral crabbing of the wheels across the rail head,

which results from the finite length of the truck (or bogie). This lateral sticking and slipping causes vibrations in the wheel to increase until a stable amplitude is reached. The stick-slip mechanism is described by a negative damping coefficient that varies with vibration amplitude. The model is used to predict the intensity of wheel squeal as a function of train speed, curve radius, and truck length. Damped and resilient wheels were tested and found effective at reducing wheel squeal. /TRRL/

For abstracts of Parts 1, 3, 4 and 5 of this series see IRRD Nos. 220732 and 220736.

Rudd, MJ (Bolt, Beranek and Newman, Incorporated) *Journal of Sound and Vibration* Vol. 46 N June 1976, pp 381-94, 7 Fig., 5 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220735)

ORDER FROM: ESL

DOTL JC

#### 10 141504

##### WHEEL/RAIL NOISE-PART 3: IMPACT NOISE GENERATION BY WHEEL AND RAIL DISCONTINUITIES

This paper is part of a series of publications dealing with wheel/rail noise (1-4). Except for comparing the relative importance of impact noise with rolling noise, this paper concerns itself exclusively with the impact noise generated by such discontinuities as rail joints, frogs, switches and wheel flats. Studies show that above a certain critical train speed the wheel separates from the rail when the interface encounters certain types of discontinuities. This critical train speed is an important acoustical parameter, because the noise generation process obeys completely different laws in the speed ranges below and above it. From the geometry, the kinematics, and the dynamics of the wheel/rail system, analytical models have been developed to identify the major variables controlling the generation of impact noise. The validity of these models has been confirmed by both scale-model and full-scale experiments. The results of the study show the following: (1) at rail joints, the height difference-and not the width of the gap -is the controlling parameter; (2) below critical train speed, impact noise increases with increasing train speed and does not depend on the direction of travel; (3) above critical train speed, the intensity of impact noise increases with increasing train speed for travel in the step-up direction but is independent of the train speed for travel in the step-down direction; (4) in generating impact noise, wheel flats are equivalent to step-down rail joints, provided flat height equals height difference at the joint; (5) both the magnitude and spectrum of impact noise produced by wheel and rail discontinuities can be predicted from a simple wheel drop test. With the knowledge gained from both the analytical and the experimental studies, we have been able to identify feasible measures for the control of impact noise. /TRRL/

Ver, IL Ventres, CS Myles, MM (Bolt, Beranek and Newman, Incorporated) *Journal of Sound and Vibration* Vol. 46 No. 3, June 1976, pp 395-417, 14 Fig., 2 Tab., 2 Phot., 30 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220734)

ORDER FROM: ESL

DOTL JC

#### 10 141505

##### WHEEL/RAIL NOISE-PART 4: ROLLING NOISE

In this paper (part IV of a series on "wheel/rail noise") analytical formulas for predicting wheel/rail rolling noise in urban rail transit systems are developed based on the characterization of the wheel/rail dynamic system developed in part I and the roughness spectra on the running surfaces of the wheels and rails. Measured values of wheel and rail roughness spectra taken on an operating rapid transit system are used with these formulas to predict the rolling noise at the wayside. These predictions prove to agree well with published data on the wayside noise from that system. In addition, measurements of the wheel roughness spectra on a small personalized rapid transit (PRT) vehicle and the rail roughness spectra on a section of the test track for that vehicle, when used in the analytical formulas, yield predictions of the wayside noise during passage of the PRT vehicle that agree well with field measurements of that noise. /TRRL/

Remington, PJ (Bolt, Beranek and Newman, Incorporated) *Journal of Sound and Vibration* Vol. 46 No. 3, June 1976, pp 419-36, 14 Fig., 2 Tab., 1 Phot., 5 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 110733)

ORDER FROM: ESL

DOTL JC

10 141506

**WHEEL/RAIL NOISE-PART 5 : MEASUREMENT OF WHEEL AND RAIL ROUGHNESS**

Part V, the final paper of the "wheel/rail noise" series, describes the measurement of wheel and rail roughness. Measurements are based on the acceleration output of a probe in contact with, and moving in relation to, the tested surface. /TRRL/

Galaitis, AG Bender, EK (Bolt, Beranek and Newman, Incorporated) *Journal of Sound and Vibration* Vol. 46 No. 3, June 1976, pp 437-51, 13 Fig., 2 Phot., 10 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220732)

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DOTL JC

10 142278

**PRESENT KNOWLEDGE ON RAILWAY NOISE. SUMMARY REPORT [Connaissances actuelles sur le bruit dans le domaine ferroviaire. Rapport de synthese]**

Assessment of the results (and what can be learned from them) obtained in the study of noise emitted and propagated outwards by railway vehicles: units used in acoustics, passenger coaches, tractive units, environment. A large part of the report is devoted to methods to reduce noise and the inconvenience it may cause in areas requiring protection. [French]

Reybardy, J Saclier, R  
French National Railways Summ. Rpt. Jan. 1976, 140 pp, Figs., Tabs.

ACKNOWLEDGMENT: UIC

ORDER FROM: French National Railways 88 rue Saint-Lazare, Paris 9e, France

10 142290

**COMMERCIAL ASPECT OF THE SOUND INSULATION OF DIESEL ENGINES**

A coating material to be bonded directly to the external surfaces of the engine is described. The basis of the palliative pad is a highly damping material made up of a laminate of heavyweight materials and varied glue lines. The glue lines, of course, must also be impervious to automobile fluids and the temperature cycles which are met on the diesel engine. The procedure involves considerable testing to ascertain the best performance for the least material used, bearing in mind that the maximum thickness allowed is normally only 6mm. When painted, the treatment becomes unobtrusive. The technique of approaching the required reduction in noise level from a diesel engine is one of progressive testing. Ideally, the initial equipment should be bonded to all known suitable parts of the engine and then removed progressively to achieve the shape, form and performance which is required. The parts of the diesel which respond would be the Front Engine Plate, Side Engine Plate, Rocker Box, Block and Sump. Typical treatment is shown.

Garrett, P (Industrial Holdings Limited) *Noise Control and Vibration Insulation* Vol. 6 No. 11, Nov. 1975, pp 337-339

ACKNOWLEDGMENT: EI

ORDER FROM: Trade and Technical Press Limited Crown House, Morden, Surrey, England

10 143144

**TECHNICAL AND MICROECONOMIC ANALYSIS OF ARSENIC AND ITS COMPOUNDS**

The role of arsenic (and its compounds) in the environment and in the economy of the United States was studied, to evaluate the need for and the projected effect of controlling its production, use, dissipation, and emission. The occurrence, chemistry, and toxicology were reviewed; the prevalence of arsenic as an impurity in commercial raw materials, processes, and products was systematically documented; the intentional commercial flow of arsenical products was quantified; the sources of pollution were identified and characterized; and the health hazards were evaluated. The intentional production and use of arsenic and its compounds is greatly exceeded by the

quantities unintentionally mobilized by industrial activities. The arsenic currently in food and water presents no identifiable health hazard, and the present controls on arsenical products, by a number of Government agencies, appear adequate. Emissions to the air from high-temperature processes are large, particulate collection devices appear largely inadequate, and the dangers presented are of serious concern.

See also report dated Mar 75, PB-244 625.

Burruss, RPJ Sargent, DH  
Versar, Incorporated, Environmental Protection Agency Final Rpt. 454-2, Task 2, EPA/560/6-76/016, Apr. 1976, 242 pp

Contract EPA-68-01-2926

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-253980/7ST, DOTL NTIS

10 143325

**IMPACTS OF CONSTRUCTION ACTIVITIES IN WETLANDS OF THE UNITED STATES**

The primary types of construction activity which severely impact wetland environments of the United States include: floodplain surfacing and drainage, mining, impoundment, canalization, dredging and channelization, and bank and shoreline construction. Each type of construction activity is attended by an identifiable suite of physical and chemical alterations of the wetland environment which may extend for many miles from the site of construction and may persist for many years. In turn, each type of physical and chemical modification has been shown to induce a derived set of biological effects, many of which are predictable, in general, if not in specific detail. The most environmentally damaging effects of construction activities in wetland areas, in order of importance, are: direct habitat loss, addition of suspended solids and modification of water levels and flow regimes. Major construction-related impacts also derive from altered water temperature, pH, nutrient levels, oxygen, carbon dioxide, hydrogen sulfide, and certain pollutants such as heavy metals, radioactive isotopes, and pesticides.

Research was sponsored by the Environmental Protection Agency.

Darnell, RM Pequegnat, WE James, BM Benson, FJ Defenbaugh, RA

Tereco Corporation, Environmental Research Laboratories EPA/600-3-76/045, Apr. 1976, 426 pp

Contract EPA-68-01-2452

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-256674/3ST, DOTL NTIS

10 143641

**ECONOMIC WELFARE IMPACTS OF URBAN NOISE**

The basic purpose of this project was to develop a conceptual framework for estimating the social welfare gains or benefits of reducing current noise levels in urban environments. The project has concentrated on developing economic welfare theory and empirical techniques to assess willingness-to-pay by individuals for noise avoidance. Particular attention was paid to noise produced by motor vehicles and noise produced by operations at construction sites. The theoretical effect of the localized nature of noise on people's willingness-to-pay to control noise was investigated. An efficient pricing scheme for aggregate noise disturbance was devised, based on people's willingness-to-pay for noise reduction. A questionnaire was developed to elicit responses on the physical and psychic costs of noise in urban areas. The attempts to assign dollar values to the costs of noise pollution by determining people's willingness-to-pay to control or reduce noise.

Thorpe, R Holmes, T  
QEI, Incorporated, Washington Environmental Research Center Final Rpt. 5531, EPA/600/5-76/002, May 1976, 216 pp

Contract EPA-68-01-2634

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-256411/0ST, DOTL NTIS

10 143691

**AIR POLLUTION ECONOMICS. VOLUME 2. 1975-JUNE 1976 (A BIBLIOGRAPHY WITH ABSTRACTS)**

Presented are abstracts covering studies on the economics of air pollution control and management. This includes the economics involved with industrial waste treatment, urban planning, government planning, and automobile and mass transportation. Specific cost studies have been excluded unless they apply to an industry or entire region. (This updated bibliography contains 72 abstracts, all of which are new entries to the previous edition.)

Supersedes PS-75535 and PS-74091.

Lehmann, EJ

National Technical Information Service Biblio. Aug. 1976, 77 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PS-760664/3ST, DOTL NTIS

10 143692

**AIR POLLUTION ECONOMICS. VOLUME 1. 1964-1974 (A BIBLIOGRAPHY WITH ABSTRACTS)**

Studies on the economics of air pollution control and management are cited. This includes the economics involved with industrial waste treatment, urban planning, government planning, and automobile and mass transportation. Specific cost studies have been excluded unless they apply to an industry or entire region. (This updated bibliography contains 206 abstracts, none of which are new entries to the previous edition.)

Lehmann, EJ

National Technical Information Service Biblio. Aug. 1976, 211 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PS-760663/5ST, DOTL NTIS

10 143693

**NOISE POLLUTION ECONOMICS (A BIBLIOGRAPHY WITH ABSTRACTS)**

The economics of noise pollution control and management is presented for industry, urban areas, Government planning, and transportation. The majority of the reports cover the economic impact of controlling aircraft noise or the impact of motor vehicle noise on society. (This updated bibliography contains 36 abstracts, 9 of which are new entries to the previous edition.)

Supersedes NTIS/PS-75/534, and NTIS/PS-74/093.

Lehmann, EJ

National Technical Information Service Biblio. Aug. 1976, 41 pp

ACKNOWLEDGMENT: NTIS

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PS-760662/7ST, DOTL NTIS

10 144016

**COMMUNITY MONITORING**

The environment project's community monitoring program served as a source for substantive findings on response to impacts, and as an aid in overall research design. It functioned through a variety of non-random, qualitative techniques to gain information on the general nature of community concerns for and responses to BART. Also, it provided a base for verification that all major physical impacts, at least those perceived by persons affected, were being studied. Additionally, it provided indications of the kinds of questions, language and direction the Phase 2 survey of response to impact should employ for the most meaningful results.

Prepared by Gruen Associates, Los Angeles, Calif., and Curtis Associates. Report on BART Impact Program Environment Project.

Metropolitan Transportation Commission, Department of Transportation, Department of Housing and Urban Development, Gruen Associates, Incorporated, Curtis Associates Work Paper DOT-BIP-WP-22-4-76, Mar. 1976, 46 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-258369/8ST, DOTL NTIS

10 144021

**BART IMPACT PROGRAM: ANALYSIS OF PRE-BART URBAN RESIDENTIAL ENVIRONMENT SURVEY**

This report presents an analysis of a 1972 home interview survey of 2,541 persons living near BART, after most of the system's construction but before its operation. Most of the survey dealt with anticipated rather than actual impacts, although perceived impacts of the system's construction were included. The analysis emphasized tests of the significance of relationships between perceived (or anticipated) BART environmental impacts and hypothesized determinants of those perceptions including specific characteristics of BART, its physical setting, and the respondents themselves. Results of the analysis included the finding that most residents had very favorable attitudes and expectations regarding BART's effects on them. Variations in these responses tended to be related mainly to the respondent's distance from BART and his or her plans to make use of the system.

Prepared in cooperation with DeLeuw, Cather and Co. and Department of Housing and Urban Development, Washington, D.C.

Metropolitan Transportation Commission, De Leuw, Cather and Company, Department of Housing and Urban Development, Department of Transportation Work Paper DOT-BIP-WP-24-4-76, Mar. 1976, 63 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

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PB-258379/7ST, DOTL NTIS

10 144068

**IN-SERVICE PERFORMANCE AND COSTS OF METHODS FOR CONTROL OF URBAN RAIL SYSTEM NOISE. EXPERIMENTAL DESIGN**

This report presents an experimental design for a project to evaluate four techniques for reducing wheel-rail noise on urban rail transit systems: (a) resilient wheels, (b) damped wheels, (c) wheel truing, and (d) rail gridding. The design presents the project questions to be answered: (1) What reduction in noise can be achieved by the techniques, individually and in combinations? (2) What are the costs of the techniques? The design gives data requirements for acoustic testing on the Southeastern Pennsylvania Transportation Authority Market-Frankford Line, as well as requirements for collection of non-acoustic data covering all United States rapid transit systems. It prescribes methods for analysis of the data, means for drawing inferences to answer the questions posed, and formats for presentation. The design requires that the findings of the completed study be presented in a manner such that the information can be used by transit system personnel who may not have a background in acoustics or cost analysis.

Work sponsored by UMTA, DOT.

Holowaty, MC Saurenman, HJ Rosen, SM  
De Leuw, Cather and Company, Wilson, Ihring and Associates,  
Incorporated, (DOT-TSC-UMTA-76-11) Intrm Rpt. UMTA-MA-06-0025-764, May 1976, 100 pp

Contract DOT-TSC-1053

ACKNOWLEDGMENT: UMTA

ORDER FROM: NTIS

PB-257200, DOTL NTIS

10 144092

**AN ASSESSMENT OF RAILROAD LOCOMOTIVE NOISE**

Measurements of the noise generated by an SD40-2 diesel electric locomotive are described. The noise was measured in three types of moving tests: the first with the locomotive passing a 6-microphone array while under maximum power acceleration, the second with the locomotive simulating the pulling of a train, and the third with the locomotive coasting by unpowered. Stationary noise measurements were made at 16-microphone positions around the locomotive while it was attached to a load cell. The moving tests show that at the lower throttle settings, wheel/rail noise may be an important contributor to the overall locomotive noise signature even at modest speeds (20 mph and above at throttle 1 and 30 mph and above at throttle 4). At throttle 8, wheel/rail noise does not become a significant source until speeds in excess of 50 mph are reached. At throttle 8 and at speeds below 50 mph, noise spectra measured opposite the moving locomotive are comparable to noise spectra measured opposite the stationary locomotive. Diagnostic tests to determine how much the various sources

contributed to the overall noise were performed at seven positions on one side of the locomotive. The engine exhaust and intake, the engine/generator, the radiator cooling fans, the dynamic brake fans, the traction motor blowers, the dust bin blower compressor, and structure-borne noise have all been identified. At high throttle settings the exhaust and radiator cooling fans dominate. At low throttle settings the engine/generator, the exhaust and the cooling fans all contribute to the overall noise.

Work was performed under contract to Transportation Systems Center, DOT, and sponsored by Office of the Secretary and Federal Railroad Administration, DOT.

Remington, PJ Rudd, MJ  
Bolt, Beranek and Newman, Incorporated, (DOT-TSC-OST-76-4) Final Rpt. DOT-TSC-OST-76-4, FRA-OR&D-76-142, Aug. 1976, 168 pp, Figs., Tabs., 6 App.

Contract DOT-TSC-1016

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

**10 145808**  
**THE PROPAGATION OF RAILWAY NOISE IN RESIDENTIAL AREAS**

The propagation of railway noise in residential areas for two commonly occurring situations was investigated: shielding by typical two-storey terraced houses parallel to the railway line, and propagation of railway noise between two rows of two-storey terraced houses perpendicular to the railway line. The investigations were made through a series of field measurements in residential areas. Conclusions have been drawn from the analyses of the recordings; analyses being for spectral and peak dB(A). Investigation was also made into the transmission loss of railway noise through a window. Transmission losses of approximately 29 dB(A) and 11 dB(A) were obtained for a closed window and an open window respectively. (Author)

Gill, HS  
Southampton University, England ISVR-TR-73, Feb. 1975, 120 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

N76-27960/3ST, DOTL NTIS

**10 147697**  
**MEASURES ASSOCIATED WITH IRON GIRDERS**

Metal bridges present special problems in controlling the propagation of train-generated noise. The open-deck bridges used on the original New Tokaido Line are now receiving priority attention with regard to noise and vibration control. Main sources of noise of a train on bridge are the wheel/rail contact and the noises emitted by vibration of the bridge structure. Sound insulating walls and plates beneath the main structure are used. Vibration damping material is also applied to metal surfaces. Tests of total enclosure of bridges have also been conducted. Effectiveness of the various noise barriers are described.

Abe, H (Japanese National Railways) *Permanent Way* Vol. 17 No. 2-3, Nos. 63-64, Nov. 1976, pp 26-50, 15 Fig., 15 Phot.

ORDER FROM: ESL

DOTL JC

**10 147698**  
**TECHNOLOGICAL DEVELOPMENT RELATING TO MEASURES AGAINST SOURCES OF NOISE**

High-speed Japanese National Railways' trains produce noise at four points: pantograph sliding on the contact wire; air passing over and about the train; wheel/rail contact; and secondary noise generated by vibration of trackside structures. Increasing restriction on train noise generation is being anticipated by tests conducted on the Tohoku Shin Kansen now being built. Work has been done on existing lines on sound insulating walls, ballast mats, details of the concrete-slab track construction and on damping of noise sources on the trains. Extensive measurements have been made on noise propagation from Shin Kansen trains.

Tatematsu, T (Japanese National Railways) *Permanent Way* Vol. 17 No. 2-3, Nos. 63-64, Nov. 1976, pp 11-25, 11 Fig., 1 Tab.

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**10 147699**  
**EFFECT AND STANDARD MEASURES OF RAILWAY NOISE**

Since 1967 Japanese National Railways' high-speed lines have been subjected to increasing noise-control standards. Standards imposed in 1971, 1972, 1974 and 1976 on noise and vibration are described.

Yorino, T (Japanese National Railways) *Permanent Way* Vol. 17 No. 2-3, Nose. 63-64, Nov. 1976, pp 1-10, 1 Fig.

ORDER FROM: ESL

DOTL JC

**10 148299**  
**RAILROAD NOISE ABATEMENT IN CHICAGO**

The Chicago Noise Ordinance does not specifically regulate railroad noise. It does, however, specify noise limits at district boundaries for particular land uses. Six cases of railroad noise and vibration problems and their solutions are discussed involving piggyback loading, parked refrigeration cars, train-switching operations and train "pass-by".

This paper appears in NOISEXOP: National Noise and Vibration Control Conference, Proceedings of the Technical Program; the conference was held in Atlanta, Georgia, April 30-May 2, 1975.

Standard, J  
Acoustical Publications, Incorporated Proceeding 1975, pp 40-42

ACKNOWLEDGMENT: EI  
ORDER FROM: Acoustical Publications, Incorporated 27101 East Oviatt, Bay Village, Ohio, 44140

**10 148313**  
**NOISE AND VIBRATION CONTROL FOR THE MARTA RAIL TRANSIT SYSTEM**

The noise produced by new high-speed rail rapid transit system operations is much less than traditionally expected due to the modern design concepts and equipment which include specific features for reducing noise and vibration. Using data obtained from various operational and experimental rail transit vehicles and systems, the noise characteristics to be expected from the MARTA facilities and equipment have been determined. The known and specified noise characteristics can be used during the planning and design of the transit systems to determine the expected wayside or community noise levels for various types of way structures, vehicles, and operational conditions, and can also be used to determine design features or system characteristics which should be included for the control of noise. This permits the inclusion of noise as one of the factors affecting the system planning and design.

This paper appears in NOISEXOP: National Noise and Vibration Control Conference, Proceedings of the Technical Program; the conference was held in Atlanta, Georgia, April 30-May 2, 1975.

Wilson, GP (Wilson, Ihrig and Associates, Incorporated); Box, S  
Acoustical Publications, Incorporated Proceeding 1975, pp 302-309

ACKNOWLEDGMENT: EI  
ORDER FROM: Acoustical Publications, Incorporated 27101 East Oviatt, Bay Village, Ohio, 44140

**10 148314**  
**RAILROAD YARD AND RIGHT-OF-WAY NOISE MONITORING**

Measurements of railroad yard and right-of-way noise levels were conducted to provide data support to the recent interstate railcarrier regulation promulgated by the Office of Noise Abatement and Control of the United States Environmental Protection Agency. It was primarily intended to augment the existing data base on these types of railroad operations. Supplemental and subordinate project objectives were to determine the instrumentation, manpower, and cost requirements, to develop and test a measurement procedure and to evaluate the reliability and accuracy of human identification of noise sources.

This paper appears in NOISEXOP: National Noise and Vibration Control Conference, Proceedings of the Technical Program; the conference was held in Atlanta, Georgia, April 30-May 2, 1975.

Konheim, AG (Environmental Protection Agency); Williams, KC  
Acoustical Publications, Incorporated Proceeding 1975, pp 291-294

ACKNOWLEDGMENT: EI  
ORDER FROM: Acoustical Publications, Incorporated 27101 East Oviatt,  
Bay Village, Ohio, 44140

**10 148315**  
**SURFACE TRANSPORTATION NOISE CONTROL**

Noise emission regulations for interstate motor carriers (medium and heavy duty trucks) and for interstate rail carriers are discussed including economic impact and inflation.

This paper appears in NOISEXOP: National Noise and Vibration Control

Conference, Proceedings of the Technical Program; the conference was held in Atlanta, Georgia, April 30-May 2, 1975.

Roper, WE (Environmental Protection Agency)  
Acoustical Publications, Incorporated Proceeding 1975, pp 279-282, 7 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Acoustical Publications, Incorporated 27101 East Oviatt,  
Bay Village, Ohio, 44140

11 053182

**NEW TECHNOLOGIES FOR GUIDED TRANSPORT SYSTEMS.  
UP-TO-DATE DESCRIPTION OF THE STATE OF RESEARCH  
AND DEVELOPMENT, MAJOR PARAMETERS FOR  
OPERATIONAL UNCONVENTIONAL HIGH SPEED  
TRANSPORT SYSTEMS**

The report gives an up-to-date account of the state of research and development in the field on non-conventional high speed transport systems in the USA, in Japan and Europe and attempts to give a forecast of practical applications expected in this field in the near and more distant future. In continuation of the work described in RP 1 further parameters for the high speed application of magnetic levitation systems were calculated with the SYSMAG computer model; the model was extended to permit calculation of data for synchronous linear motor propulsion with the active part in the track.

This report is only intended for internal use by ORE Member Administrations.

International Union of Railways C135/RP 2/E, Oct. 1975, 139 pp, 51 Fig., 7 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

11 093733

**EXPERIMENTAL AERODYNAMIC CHARACTERISTICS OF  
VEHICLES TRAVELING IN TUBES**

A simplified theoretical model for a vehicle traveling through an unvented tube under equilibrium incompressible conditions was used to guide the test program, reduce the data, and determine the self-consistency of the results. The results were then used to establish values for the arbitrary coefficients in the theoretical model. Substantial progress was made in understanding the aerodynamic characteristics of vehicles traveling in tubes as exemplified by the good agreement of the theoretical model predictions with the experimental data throughout the Reynolds number range (three orders of magnitude, up to that for an actual full-scale system) and the many geometric variables tested. (Author)

Kurtz, DW Dayman, BJ  
Jet Propulsion Laboratory NASA-CR-143490, July 1975, 69 pp

Contract NAS7-100

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS Repr. PC, Microfiche

N75-31010/2ST, DOTL/NTIS

11 133089

**COMMAND AND CONTROL STUDIES FOR PERSONAL RAPID  
TRANSIT, PROGRAM STATUS, 1974**

The document reviews the APL effort on command and control systems for circulation and distribution applications. A brief history of the program is given, together with the results of the work and its effects on system performance. The discussion is divided into an investigation of vehicle management (the controlling of a fleet of vehicles in terms of scheduling, dispatching, empty vehicle allocation, and station operation) and an investigation of vehicle regulation (the controlling of an individual vehicle either alone or within a string of vehicles). A bibliography of the reports, papers, and significant memoranda relating to this work is included, as well as summary descriptions of the major digital computer simulations that have been developed in support of these investigations.

See also PB-231681.

Hinman, EJ  
Johns Hopkins University, Laurel, Urban Mass Transportation  
Administration, (UMTA-MD-06-0018) Tech. Rpt. UMTA-MD-06-  
0018-74-3, Apr. 1975, 165 pp

Contract DOT-UT-30010

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-250553.5ST, DOTL NTIS

11 133167

**A SURVEY OF PROPULSION SYSTEMS FOR HIGH CAPACITY  
PERSONAL RAPID TRANSIT**

The high-capacity personal rapid transit (HCPRT) system must operate with very short headways. To achieve safe operation at these headways, the propulsion system should meet certain unconventional requirements. They include reversible thrust capabilities, short response time, and peak thrust exceeding three times nominal thrust. These requirements were determined by analysis, computer simulations, and data provided by DOT/TSC. Five propulsion systems capable of meeting these requirements have been surveyed in this report. As background to the survey, several vehicle resistance curves were calculated for a baseline vehicle with assumed dimensions and weight. Four types of vehicle suspension methods were considered.

Knutrud, T  
Kusko (Alexander) Incorporated, Urban Mass Transportation  
Administration, Transportation Systems Center Final Rpt. UM-  
TA-MA-06-0048-75-2, July 1975, 110 pp

Contract DOT-TSC-203

ACKNOWLEDGMENT: NTIS  
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PB-250581/6ST, DOTL NTIS

11 133318

**ANALYSIS OF MULTIPLE PARTY VEHICLE OCCUPANCY IN  
AN AUTOMATED GUIDEWAY SYSTEM**

Many proposed new urban transit systems offer demand-actuated service between stations, vehicles being shared by several passengers. An analysis has been made of the operation of multiple-party occupancy systems in which the guideway network consists of a single loop or of several interconnecting loops. Vehicles circulate freely around the loop or loops of the network. A vehicle enters a station only if it has passengers to discharge or the station has passengers waiting for service and the vehicle can accommodate them. Vehicles placed in storage at each station may be used whenever serious queuing of waiting passengers develops. A means for replenishing storages and a procedure for limiting the number of intermediate stops experienced by a passenger are described.

Williams, MB Ford, BM Waddell, MC  
Johns Hopkins University, Laurel, Urban Mass Transportation  
Administration, (UMTA-MD-06-0018) APLJHU-CP-042TPR-032,  
UMTA-MD-06-0018-76-1, Mar. 1976, 93 pp

Contract DOT-UT-30010

ACKNOWLEDGMENT: NTIS  
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PB-251930/4ST, DOTL NTIS

11 134682

**PASSENGER BEHAVIOR STUDIES FOR AUTOMATIC TRANSIT  
SYSTEMS**

This paper reports on part of the coordinated Minitram research program in the United Kingdom being carried out by various groups under the direction of the Transport and Road Research Laboratory. The section of work discussed relates to tests carried out in full-scale simulations of passenger behaviour on vehicles and stations to determine the effects on dwell and clearance times of changes in station and vehicle configuration, door sizes and opening times, and directional barriers. The tests were carried out with passengers stratified into commuters, noncommuters, and handicapped populations.

Ashford, N Feeney, FJ *Transportation Research Record* No. 559, 1975,  
pp 63-72, 8 Fig., 1 Tab., 8 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

11 136988

**GRAVITY ASSISTED MASS TRANSIT**

In fixed guideway transit with established station stops, the propulsion energy can be reduced by grading the guideway downward on leaving the station (using gravity to assist in the acceleration) and grading upward on arrival at the next station (again using gravity, but this time to assist in the



braking). A computerized conceptual cost model has been developed incorporating parameters relating to required elevated structures and required dynamical considerations. The increase in total cost required to construct a station stop at a given elevation above the guideway level between stops is calculated by the computer program to be compared with the resultant decrease in energy consumed in acceleration and deceleration. Because today's costs are extremely uncertain, unit costs are input by the user to determine the increased construction and operating costs and the resultant energy savings. The program outputs suggestions for structural design and associated cost data.

Kovacs, AZ Shaw, GB Weiss, RF Nelson, JKJ  
Dayton University, Urban Mass Transportation Administration, (UMTA-OH-11-0002) UDSE-TR-75-02, UMTA-OH-11-0002-75-1, June 1975, 120 pp

ACKNOWLEDGMENT: NTIS  
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PB-253416/2ST, DOTL NTIS

#### 11 137306

##### PRT IMPACT STUDY, A PRE-PRT PHASE. VOLUME I. TRAVEL ANALYSIS

Part of a three-volume work, this report describes the analysis performed on travel data collected for the Pre-PRT Impact Study. The data analyzed consist of travel behavior, travel patterns, model utilization and travel costs of various modes of travel in Morgantown before the revenue operation of the PRT in Morgantown. The analysis resulted in estimates of travel by various subpopulations by automobile, university bus and city/county bus systems in Morgantown. Further analysis conducted yielded estimates of traffic flow between various activity centers in Morgantown. Trip generation, trip distribution and modal split were estimated for Morgantown PRT corridor travel before the revenue operation of the PRT.

See also PB-254482.

Elias, SEG Redwine, CN Deshpande, GK  
West Virginia University, Urban Mass Transportation Administration, Transportation Systems Center Final Rpt. UMTA-MA-06002676/1V1, Mar. 1976, 91 pp

Contract DOT-TSC-985-1

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254481/5ST, DOTL NTIS

#### 11 137307

##### PRT IMPACT STUDY, PRE-PRT PHASE. VOLUME II. DATA COLLECTION PROCEDURE AND CODING MANUAL

The report describes the procedures utilized for collection of data on transportation demand and supply prior to the revenue operation of the Personal Rapid Transit (PRT) System in Morgantown, West Virginia. Most of the report is devoted to describing various surveys which were conducted to obtain information about travel patterns, attitudes, and demographic characteristics of residents of the Morgantown area. The report also discusses the collection of data reflecting the volume of transportation usage, such as traffic counts, bus ridership counts, and speeds of autos and buses. Also described are the costs of operating an automobile and costs and revenues of the bus systems operating in the Morgantown area. The report includes documentation of the format and codes used for placing the survey data on magnetic tape.

See also PB-254483.

Elias, SEG Redwine, CN Trent, RB Rovelstad, JM Mallik, AK  
West Virginia University, Urban Mass Transportation Administration, Transportation Systems Center Final Rpt. UMTA-MA-06002676/1V2, Mar. 1976, 163 pp

Contract DOT-TSC-985-2

ACKNOWLEDGMENT: NTIS  
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PB-254482/3ST, DOTL NTIS

#### 11 137308

##### PRT IMPACT STUDY, PRE-PRT PHASE. VOLUME III. FREQUENCY TABULATIONS FROM FOUR TRANSPORTATION-RELATED SURVEYS

The report gives tabulations of survey responses which were collected in Morgantown, West Virginia, as part of a study to assess the impact of the installation of the Personal Rapid Transit (PRT) System.

See also PB-254481.

Redwine, CN  
West Virginia University, Urban Mass Transportation Administration, Transportation Systems Center Final Rpt. UMTA-MA-06002676/1V3, Mar. 1976, 151 pp

Contract DOT-TSC-985-3

ACKNOWLEDGMENT: NTIS  
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PB-254483/1ST, DOTL NTIS

#### 11 137312

##### MATRIX ANALYSIS OF LINEAR INDUCTION MACHINES

A new method of analyses for linear induction machines, the matrix method, has been developed. The method handles linear induction motors, both single and double-sided, and linear induction liquid metal pumps and generators, both flat and annular. The primary currents can be prescribed, calculated from prescribed phase voltages, or optimized for maximum machine efficiency. The matrix method incorporates accurate modeling of the magnetic field of the finite-length iron including the fields due to fringing, variable gap, slots, coils, and phase belts. The coils may have any arbitrary phase connections.

Elliott, DG  
Jet Propulsion Laboratory, Federal Railroad Administration Final Rpt. JPL-SP-43-24, FRA/ORD-75/77, Sept. 1975, 358 pp

ACKNOWLEDGMENT: NTIS  
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PB-254574/7ST, DOTL NTIS

#### 11 139505

##### OPTIMIZATION OF WALT DISNEY WORLD'S MONORAIL SYSTEM THROUGH COMPUTER SIMULATION

The simulation model was used to optimize the operation of the express monorail beam under all possible attendance levels and hourly guest arrival rates. Optimization was obtained, through simulation, by determining for each possible operating condition the one optimal system configuration which simultaneously best satisfied the following two constraints: (1) Minimum guest wait time-a guest imposed constraint; (2) Maximum system utilization-a cost imposed constraint. The simulation results allowed Disney management to effectively project daily operating requirements and, thus, schedule train usage accordingly. System implementation has resulted in significant direct cost savings through more efficient equipment utilization.

Presented at the 8th Annual Simulation Symp., Tampa, Fla., March 12-14, 1975.

Laval, B (Walt Disney World)  
Annual Simulation Symposium Proc Paper 1975, pp 1-10, 2 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: IEEE

IEEE 75 CH0984-5C

#### 11 139512

##### ON LINEAR SYNCHRONOUS MOTOR (LSM) FOR HIGH SPEED PROPULSION

This paper presents the steady state performance characteristics of LSM fed from a voltage-source frequency converter. A model, similar to the one used for conventional synchronous motor analysis, has been used to study the steady state behavior of the LSM system. The results of the following investigations are discussed. Effects of various section lengths of the guideway winding on the performance characteristics of the LSM system, behavior of the LSM system at different speeds, and a comparative study of the linear induction motor (LIM) and LSM systems.

Presented at the 13th International Magnetics Conference, Imperial College of Science and Technology, London England, April 14-17, 1975.

Sen, PC (Queen's University, Canada) *IEEE Transactions on Magnetics*  
Vol. 11 No. 5, Sept. 1975, pp 1489-86, 3 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**11 139542**  
**INTERIM REPORT ON LINEAR SYNCHRONOUS MOTOR**  
**EXPERIMENTAL MODEL**

This report describes a low power, small scale experimental linear synchronous motor (LSM) test facility that has been built at Queen's University. The research project is part of the Canadian Maglev Project which is administered by the Canadian Institute of Guided Ground Transport under contract to the Transportation Development Agency. Details of the circular track, which consists of a distributed 3-phase winding and aluminum rails for vehicle support and guidance, the vehicle, which carries a four pole permanent magnet assembly and electronic instrumentation and transmitting equipment, and the cycloconverter, which provides 3-phase variable frequency, variable voltage excitation for the track, are reported. A summary of the salient LSM model design figures is presented.

Dawson, GE John, VI Sen, PC Bennett, JA Clarke,  
DJ Lakhavani, S Unteregelsbacher, E  
Canadian Institute of Guided Ground Transport, (Proj. No. 6.18.74) No.  
74-7, Aug. 1974, 25 pp, 13 Fig., 29 Ref., 1 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

**11 139543**  
**PERFORMANCE CHARACTERISTICS OF VARIABLE SPEED**  
**LINEAR SYNCHRONOUS MOTOR**

The analysis of a single-sided moving magnet variable speed linear synchronous motor (LSM) is considered in this paper. A single-phase equivalent circuit similar to that of a conventional synchronous machine is the starting point in the analysis. The effect of the removal of ferromagnetic material from the magnetic circuit of the machine on its performance is examined. Performance characteristics of the LSM when the power supply has voltage and current control are determined.

Dawson, GE John, VI  
Canadian Institute of Guided Ground Transport No. 74-6, Aug. 1974, 20  
pp, 6 Fig., 6 Ref., 1 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

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**11 141100**  
**LEVITATION FORCES IN SINGLE-SIDED LINEAR INDUCTION**  
**MOTORS FOR HIGH-SPEED GROUND TRANSPORT**

The levitation force and thrust in a current-controlled single-sided linear induction motor which propels electro-dynamically-levitated vehicles are discussed. It has been shown theoretically that the single-sided linear induction motor (SLIM) can operate satisfactorily over suitably large clearance gap compared with the effective height of electrodynamic suspension. The levitation force in SLIM can be used practically as an alternative levitation force in the low-speed region by supplying a primary current several times the rated current within the very short acceleration times. In high-speed Maglev vehicle system with electrodynamic suspension and SLIM propulsion, the aluminum plate for levitation can be saved for the distance to accelerate the vehicle to speeds sufficient for electrodynamic levitation by the cryogenic magnets.

Yoshida, K (Kyushu University, Japan); Nonaka, S *IEEE Transactions on Magnetics* Vol. 11 No. 6, Nov. 1975, pp 1717-19, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**11 141101**  
**ON THE INDUCTIVE LEVITATION SYSTEM WITH FINITE**  
**SECONDARY WIDTH [Elektrodynamisches Tragsystem mit endlich**  
**breiter schiene]**

A suitable model for a general inductive levitation system is presented and then treated by means of the vector potential. The solutions are described by two-dimensional Fourier series and include treatment of a finite secondary width and an arbitrary cross section. The excitation system consists of superconducting coils which are arranged in normal flux, and null flux configuration, respectively. From the magnetic field, the force components for levitation, guidance and drag are determined. [German]

Lang, A (Technical University of Braunschweig, West Germany);  
Weh, H May, H *Archiv fuer Elektrotechnik* Vol. 57 No. 5, Dec. 1975,  
pp 223-233, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**11 141102**  
**WAITING TIMES IN GUIDED TRANSPORTATION SYSTEMS**  
**[Les temps d'attente dans les transports en site propre]**

The paper analyzes the random and transient components of time losses in waiting and intermediate stops of guided transportation means, in terms of the headway between successive vehicles. Waiting time is radically reduced with very small headways in stations (a few seconds between vehicles). Eliminating all intermediate stops results in such a constraint upon the traffic on a single line that the waiting time in stations increases much more than the time saved on the stops. The operation is much improved by keeping a few intermediate stops on each route. [French]

Kadosch, M (Societe SYTEC, France) *Automatisme* Vol. 21 No. 1-2, Jan.  
1976, pp 19-25

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**11 141106**  
**BRINGING LOGIC TO URBAN TRANSPORTATION**  
**INNOVATION**

To reduce the space needed for transportation, both the physically and the socially perceived size of urban transportation facilities must be reduced. This means reducing the time spacings between moving vehicles, as well as their space consumption when stopped. Reducing time spacings requires automating the driver function--with vehicles under automated operation short headways (time spacings between vehicles) on automated guideways. To equal an eight-lane expressway's capacity, a two-lane guideway would have to carry four times as many vehicles per hour. True personal rapid transit means personalized vehicle service and fraction-second headways. Without fraction-second headways, passengers must be assembled to boost line-haul capacity, service is degraded, and per-mile system costs are increased. Thus, significant improvement in urban transit service in general also requires very-short-headway systems. Fraction-second headways are the only way to lighten transit vehicles and reduce structure size and costs--both direct costs and the social costs of large guideway structures and, similarly, urban highways.

Brand, D (Harvard University) *Technology Review* Vol. 76 No. 3, Jan.  
1976, pp 38-45

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**11 141109**  
**DIFFERENCE-FLUX GUIDANCE SYSTEM FOR**  
**MAGNETICALLY LEVITATED VEHICLES**

For guiding magnetically levitated vehicles propelled by an ironless synchronous linear motor, a system operating on the difference-flux principle has excellent characteristics. Strong restoring forces are produced even on small deflections. The electrodynamic power loss is small compared with that of other systems. Transient oscillations of the vehicles can be damped by additional control coils.

Gloeel, J *Siemens-Entwicklungsberichte* R&D Rept. Vol. 5 No. 2, 1976, pp  
85-91

ACKNOWLEDGMENT: EI  
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**11 141110**  
**INTRINSIC DAMPING IN BASIC MAGNETIC LEVITATION SYSTEMS WITH A CONTINUOUS SHEET TRACK**

Previous work on basic magnetic levitation systems is extended to analyze vertical and lateral intrinsic damping in these systems under the assumption that quasi-static forces remain essentially unchanged in dynamic situations caused by small vertical and/or transverse perturbations. The analysis shows that the intrinsic damping is quite small.

Urankar, L *Siemens-Entwicklungsberichte* R&D Rept. Vol. 5 No. 2, 1976, pp 110-119

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**11 141111**  
**STUDY OF SUPERCONDUCTING MAGNETIC SUSPENSION AND GUIDANCE CHARACTERISTICS ON LOOP TRACKS**

Studies of the characteristics of superconducting magnetic suspension and guidance systems for high speed trains on loop tracks are reported. The theoretical results are compared with experimental results obtained by rotating test devices and running test vehicles driven by linear motors.

Iwahana, T (Railway Technical Research Institute, Japan) *IEEE Transactions on Magnetics* Vol. 11 No. 67, Nov. 1975, pp 1704-11

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**11 141116**  
**MATHEMATICAL MODEL TO SIMULATE THE MAGNET-RAIL SYSTEM FOR FAST TRAINS [Rechenmodell zur Simulation des Systems Magnet-Schiene fuer Schnellbahnen]**

For the accurate simulation of the behavior of the suspension units for electromagnetically floating vehicles a theoretically derived and empirically adjustable calculation model is presented and discussed. A representation structure includes the experimentally determined non-linear and dynamic functions of the prototype; the corresponding calculation circuit designed as an analog computer reproduces and extends them to the overall behavior. The application of the model results in rational methods in the further development of the system. [German]

Senatori, L (Messerschmitt-Boelkow-Blohm, West Germany) *Elektrotechnische Zeitschrift, Ausgabe A* Vol. 97 No. 3, Mar. 1976, pp 173-176, 1 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**11 141128**  
**SUPERCONDUCTING MAGNETIC LEVITATION AND LINEAR SYNCHRONOUS MOTOR PROPULSION FOR HIGH SPEED GUIDED GROUND TRANSPORTATION**

This report describes the results of Phase II of the Canadian Maglev program, involving an investigation of the use of superconducting magnets for electrodynamic levitation and guidance and for linear synchronous motor (LSM) propulsion of high speed guided ground transportation. The technical and operating characteristics of a Maglev system with vehicles cruising at 480 km/hr (300 mph) have been investigated. Reference designs for the levitation, guidance and propulsion system and for the guideway have been compiled, and a first estimate of Maglev vehicles characteristics, including a weight analysis, aerodynamic effects, noise and energy efficiency, has been made.

A Phase-II Contract Report prepared by the Canadian Maglev Group, CIGGT, for the Canadian Transportation Development Administration.

Eastham, AR Atherton, DL  
Canadian Institute of Guided Ground Transport, (Project No.D.71.72)  
Prog. Rpt. CIGGT Rept. N.75-5, Mar. 1975, 317 pp, 99 Fig., 17 Tab., 19 Phot., 102 Ref., 6 App.

ACKNOWLEDGMENT: CIGGT  
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DOTL RP

**11 141460**

**DETERMINATION OF A SUITABLE NUMBER OF POLES FOR ASYNCHRONOUS LINEAR MOTORS WITH FIXED DIMENSIONS AND FOR HIGH SPEEDS [Ermittlung einer gunstigen Polzahl bei asynchronen Linearmotoren mit vorgegebenen Abmessungen und grossen Geschwindigkeiten]**

No Abstract. [German]

Feldmann, U *Elektrotechnische Zeitschrift, Ausgabe A* Vol. 97 No. 4, Apr. 1976, pp 195-200, 4 Tab., 10 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

**11 141501**  
**CURRENT COLLECTION FOR HIGH-SPEED TRANSIT SYSTEMS**

Conventional power pick-up is generally based on systems with metal shoes running on rails at ground level, or an overhead pantograph with a carbon block running on a wire. These systems have reached their development limit at approximately 40 m/s. The authors discuss the problems associated with current collection, and the design, construction and testing of rotating brush devices for use with high-speed transit systems. Brass was found to be the most successful brush material, with mild steel also performing well. Test results indicated that a brass brush carrying 500 A at 120 m/s (430 km/h) would last 6500 km; and that if the current density was limited to about 250 A per brush then the mild steel brush could perform equally as well. It is concluded that (1) the feasibility of using rotating wire brushes for current collection at speeds up to 120 m/s has been proven. Whilst wear rates are not excessively low, they are economically acceptable for a system at this early stage of development; (2) improved wear rates should be achieved by concentrating on materials known to be resistant to fracture by repeated bending, and by the use of finer wire gauges; (3) in future development work, the force of interaction between the brush and rail should be studied in order to develop a suitable brush support system. This should preferably be based on a linear rail system. /TRRL/

Appleton, AD Bartram, TC MacMichael, DBA Fletcher, G  
(International Research & Development Company, Ltd) *Hovering Craft and Hydrofoil* Vol. 15 No. 8, May 1976, pp 58-63, 5 Fig., 3 Phot., 2 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRR 220743)  
ORDER FROM: ESL

DOTL JC

**11 141572**  
**SOME AERODYNAMIC ASPECTS OF PNEUMATIC AIR VACUUM PROPULSION IN TUBE VEHICLE SYSTEMS**

This paper presents an overview of several years of theoretical and experimental investigations of the aerodynamics of vehicles propelled in tubes by air-vacuum propulsion. A historical background of pneumatic propulsion with emphasis on ARO-Duke team activities is given. Discussion of the concept and its three phases of pneumatic flight are introduced. Summary presentations of incompressible flow, quasi-steady compressible flow and non-steady viscous flow analyses are made. Seven different pneumatic tube facilities, five developed and tested by ARO-Duke team and two built by the IIT team have been briefly discussed. Tube diameters range from 1.25 inches to 12 inches and L/D spans from 80 to 2,880 for the various tubes. Predictions of theoretical analyses compare well with experimental results on the various tubes. Vehicle velocities up to 777 mph were achieved. Data correlation of various tubes with L/D up to 480 shows excellent similitude. A brief report on an experimental and theoretical assessment of supplemental air inlet is included. Certain problems and difficulties that can develop in a pneumatic transportation system and some conceptual approaches for their solutions are given in the closing.

Kumar, S (Illinois Institute of Technology) *High Speed Ground Transportation Journal* Vol. 10 No. 2, 1976, pp 113-134, 8 Fig., 1 Tab., 17 Ref.

ACKNOWLEDGMENT: High Speed Ground Transportation Journal  
ORDER FROM: ESL

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11 141573

**LATERAL DYNAMICS OF A TRACKED AIR-CUSHION VEHICLE**

Linearized equations of motion for a TACV are developed in the three degrees-of-freedom of lateral displacement, yaw angle, and body roll angle. Air cushion forces and the aerodynamic loads on the body are included by means of stability derivatives. The lateral dynamic stability of the vehicle is analyzed by the use of root-locus diagrams. The vehicle is found to have three stable modes and one unstable mode. The body aerodynamics are shown to play a major role in the lateral dynamics.

Davis, PJ (General Electric Company); Hawks, RJ (Clarkson College of Technology) *High Speed Ground Transportation Journal* Vol. 10 No. 4, 1976, pp 135-146, 5 Fig., 1 Tab., 9 Ref.

ACKNOWLEDGMENT: High Speed Ground Transportation Journal  
ORDER FROM: ESL

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11 142263

**A VEHICLE FOR THE NEW FREIGHT TRANSPORTATION SYSTEM--THE STUDY ON ITS FUNDAMENTAL STRUCTURE**

Linear-induction-motor-propelled vehicles for transporting containers are being studied by Japanese National Railways. The 13-m cars, each capable of transporting four 5-ton or two 10-ton containers, would operate individually with destination classifications occurring at junctions rather than in yards with consequent delay. The basic plan and its fundamental problems have been examined, primarily the influence of the lateral stiffness of axle springs on caster effect and the structural and dynamic loads of the vehicle. There was no fundamental difficulty seen in constructing a car necessary for the JNR's New Freight Transportation System.

Koyanagi, S  
Railway Technical Research Institute Quart Rpt. Vol. 17 No. 2, 1976, pp 78-82, 12 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute  
ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

11 142288

**PROPULSION OF MAGNETICALLY LEVITATED TRAINS**

A propulsion system for magnetically levitated trains is proposed. A method of periodically energizing magnetic loops on a train moving over a periodically undulating track allows the net repulsive magnetic force to tilt forward or backward for either propulsion or braking. The principle is explained and a specific example discussed. Approximate calculations show feasibility. Problems requiring technical solutions which cannot be considered present state-of-the-art are ac losses at frequencies up to 20 Hz and mechanical fatigue properties at low temperatures. Suitable primary power could be derived from hydrogen fuelled turbines yet to be developed.

Wipf, SL (Los Alamos Scientific Laboratory) *Cryogenics* Vol. 16 No. 5, May 1976, pp 281-288, 13 Ref.

ACKNOWLEDGMENT: EI  
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11 142315

**TRACK DESIGN CRITERIA FOR P.R.T. SYSTEMS IN URBAN AREAS**

This paper takes a look at the potential of personalized rapid transit systems. A PRT system is regarded as a public transport system with small-to-medium sized vehicles independently controlled and traveling on reserved tracks. Firstly, the idea of the PRT system is viewed against the background of present urban transport problems and studied in relation to other possible solutions. Then, using the systems approach, planning goals and objectives are developed. The social, economic and physical aspects of the various alternatives are then evaluated against these objectives.

Copsey, NR (Damas and Smith Limited) *High Speed Ground Transportation Journal* Vol. 10 No. 1, Mar. 1976, pp 59-84, 15 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

11 143202

**MORGANTOWN PERSONAL RAPID TRANSIT LONGITUDINAL CONTROL SYSTEM DESIGN SUMMARY**

Experience with the longitudinal control system used on each vehicle in the Morgantown Personal Rapid Transit System has shown that nonlinearities and variations in control system parameters can significantly affect performance if such characteristics are not adequately considered in the system design. A design summary is provided that documents this experience and emphasizes the important analysis and hardware design problems encountered. The performance capability of the final design is computed on the basis of analysis and test results. A description of the detailed nonlinear analytical model developed is included for possible use in future studies. Potential system improvements are described that may be the objects of future research and development.

See also PB-202713.

Lang, RP  
Boeing Company, Transportation Systems Center, Urban Mass Transportation Administration Final Rpt. DOT-TSC-UMTA-75-23, Dec. 1975, 158 pp

Contract DOT-TSC-994

ACKNOWLEDGMENT: NTIS  
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PB-256139/7ST, DOTL NTIS

11 144064

**DEVELOPMENT AND TEST OF AN EDDY-CURRENT CLUTCH-PROPULSION SYSTEM**

This report covers the Phase 1 effort which is to develop and to test an/AC-propulsion system for personal rapid-transit vehicles. This propulsion system incorporates an AC-induction motor in conjunction with an eddy-current clutch and brake. Also included are development of the propulsion system, fabrication of the propulsion system, description of the laboratory test program, and analysis of the test results.

Work sponsored by UMTA, DOT.

Adams, GJ (Transportation Systems Center)  
Mobility Systems and Equipment Company, (DOT-TSC-UMTA-73-8)  
Final Rpt. UMTA-MA-06-0027-731, Oct. 1973, 202 pp

Contract DOT-TSC-357-1

ACKNOWLEDGMENT: UMTA  
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PB-225093, DOTL NTIS

11 144065

**POWER AND PROPULSION CHARACTERISTICS OF THE DULLES TRANSPO '72 PERSONAL RAPID TRANSIT VEHICLES**

The Power and Propulsion Characteristics of the four different PRT vehicles demonstrated at Transpo '72 are determined by using analytical descriptions, manufacturers' data, and the test data from the Post-Transpo '72 Test Program. A comparative analysis of the four systems is presented. The performance features necessary to adequately describe each vehicle's power and propulsion characteristics are also discussed.

Work sponsored by UMTA, DOT.

Raposa, FL Phillips, WE, Jr (Kusko (Alexander) Incorporated)  
Transportation Systems Center, (DOT-TSC-UMTA-74-12) Final Rpt.  
UMTA-MA-06-0031-752, July 1975, 116 pp

Contract MA-06-0031

ACKNOWLEDGMENT: UMTA  
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PB-245027, DOTL NITS

11 144076

**PEOPLE MOVERS**

Automated guideway transit is described along with its possible impact on other forms of urban transportation.

Mennie, D *IEEE Spectrum* Vol. 13 No. 7, July 1976, pp 85-89

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11 145153

**DYNAMIC INTERACTIONS BETWEEN VEHICLES AND ELEVATED, FLEXIBLE RANDOMLY IRREGULAR GUIDEWAYS**  
A dynamic interaction model is formulated for the heave-pitch motion of vehicles crossing elevated flexible, randomly irregular spans. Span dynamic motion due to a vehicle passage is modeled using a Bernoulli-Euler beam model and modal analysis techniques. Four types of random irregularities characteristic of elevated guideways are modeled numerically including vertical span offset, pier misalignment, camber, and surface roughness. Analytical expressions for each irregularity power spectral density are derived and the relative contributions of irregularities to vehicle excitation are examined. The limitations to vehicle passenger comfort levels posed by guideway deflection and irregularity are illustrated for personal and rapid transit types of vehicles.

Contributed by the Automatic Control Division for presentation at the Winter Annual Meeting, New York, N.Y., December 5-10, 1976, of the American Society of Mechanical Engineers.

Snyder, JE, III Wormley, DN (Massachusetts Institute of Technology) American Society of Mechanical Engineers Conf Paper 76-WA/AUT-2, Dec. 1976, 11 pp, 10 Fig., 1 Tab., 23 Ref., 1 App.

ACKNOWLEDGMENT: ASME  
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DOTL RP

11 145157

**INTERSECTION MERGE CONTROL IN AUTOMATED TRANSPORTATION SYSTEMS**

Merging algorithms capable of resolving conflicts in automated transit systems are studied. The effectiveness of five basic algorithms are compared via theoretical evaluations of the ability of each algorithm to resolve merge conflicts.

Caudill, RJ Youngblood, JN *Transportation Research* Vol. 10 No. 1, Feb. 1976, 8 pp, 7 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: ESL

DOTL JC

11 145171

**AIR CUSHION TECHNOLOGY IN CANADA 1975**

The purpose of this report is to bring to the attention of all who are concerned with Canada's air cushion industry: an outline of the commercial activities in the design, development, and manufacture of air cushion vehicles (ACVs) in Canada; the R&D programs within the companies themselves as well as in Canadian universities and various government departments; and last but not least, the industrial assistance programs of various types that are underway in certain government departments and agencies to assist the Canadian ACV industry.

National Research Council of Canada Res. Rpt. Jan. 1976, 45 pp, Photos.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

11 145597

**A PRELIMINARY EVALUATION OF ELECTRICAL PROPULSION BY MEANS OF IRON-CORED SYNCHRONOUSLY OPERATING LINEAR MOTORS**

The report is a preliminary evaluation of the technical feasibility of using iron-cored, synchronously operating motors to propel ground transportation vehicles in the high cruise speed range. A second consideration is the possibility that the motor might also provide strong attractive and lateral forces. Three motor types, all realizable with passive track rails are investigated: (a) claw-pole synchronous motor, (b) homopolar inductor motor, and (c) heteropolar inductor motor. A rail clearance of 1.5 cm is specified. However, the effect of variations in this and other design parameters is also analyzed. All three types considered compare favorably with an equivalent single-sided induction motor, insofar as weight, efficiency, and power factor are concerned. The calculations are supported by analog simulation experiments.

Levi, E

Polytechnic Institute of New York, Federal Railroad Administration Tech. Rpt. FRA-TR-76-128, Jan. 1975, 113 pp

Contract DOT-FR-30030

ACKNOWLEDGMENT: NTIS  
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PB-258437/3ST, DOTL NTIS

11 145807

**LONG DISTANCE RAIL TRANSPORTATION. PART A: RAPID RAIL TRANSPORTATION USING NONCONTACTING TECHNOLOGY [Spurgeführter Fernverkehr. Teil A: Spurgebundener Schnellverkehr mit Beruehrungsfreier Fahrtechnik]**

Status reports are presented on research and development in the Federal Republic of Germany. Topics are centered around magnetic levitation technology. Repulsive and attractive approaches and associated track problems are discussed. Problems connected with a test facility for transportation technologies are outlined. [German]

Seri-2. Conf-Proc. Of the Statusseminar, Schliersee, West Germany, March 12-14, 1975.

Federal Ministry for Research and Technology BMFT-FB-T-75-36-PT-A, Dec. 1975, 166 pp

ACKNOWLEDGMENT: NTIS  
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N76-28111/2ST, DOTL NTIS

11 147572

**LINEAR INDUCTION MOTOR RESEARCH VEHICLE SPEED UPGRADING TESTS (190 TO 250 MPH)**

The linear induction motor research vehicle (LIMRV) was subjected to a series of test runs at speeds of 190 to 250 mph on the Department of Transportation 6.2-mile-long, standard gauge railroad track at the Transportation Test Center, Pueblo, Colorado. High-speed dynamic performance data on the vehicle, trucks, suspension systems, and LIM guidance system were acquired by means of instrumentation that measured accelerations and displacements. For these tests the LIMRV was fitted with two jet engines that enabled it to accelerate to high speeds during the first 2.3 miles of travel, leaving nearly 4 miles of track for constant-speed data collection and braking. The LIMRV operated in a fully stable manner dynamically up to the maximum speed attained, 255.7 mph. Sufficient data was collected so that a safe LIMRV operating profile could be constructed as a baseline for conducting LIM electrical performance tests with full confidence in the vehicle's dynamic stability up to its design speed of 250 mph.

Research was sponsored by the Federal Railway Administration, Office of Research and Development.

Chi, CC

AiResearch Manufacturing Company of California, (74-11035, Rev. 1) Final Rpt. FRA-OR&D 76-268, June 1976, 102 pp, Figs., Tabs., 6 Ref., 1 App.

Contract DOT-FR-30026

ACKNOWLEDGMENT: FRA  
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PB-261852/AS, DOTL NTIS

11 147576

**LINEAR INDUCTION MOTOR RESEARCH VEHICLE REACTION RAIL EDGE EFFECT INVESTIGATION. THE EFFECT OF RAIL SLOTTING**

The purpose of this investigation was to obtain full-scale linear induction motor performance data with a slotted reaction rail. The motor thrust characteristics were determined with two different airgap widths at each of two different slot pitches. Test results showed essentially no variation in motor thrust characteristics with a slotted vs. an unslotted reaction rail. On the basis of this investigation (35 separate test runs were performed) it is concluded that slotting the reaction rail does not enhance LIM performance. This is a significant finding because slotting increases the cost of reaction rail fabrication.

Research sponsored by the Federal Railroad Administration, Office of Research and Development.

Powell, RB

AiResearch Manufacturing Company of California, (75-11825, Rev. 1) Final Rpt. FRA-OR&D-72-263, Apr. 1976, 28 pp, Figs., Tabs., 8 Ref., 1 App.

Contract DOT-FR-40016

ACKNOWLEDGMENT: FRA  
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PB-261811/AS, DOTL NTIS

11 147577

**A COMPARISON OF LIMRV LIM GUIDANCE SYSTEM EXPERIMENTAL DATA WITH MATHEMATICALLY PREDICTED VALUES USING REACTION RAIL SURVEY DATA**

This document discusses the survey of 1,000 feet of Linear Induction Motor Research Vehicle (LIMRV) reaction rail at the Department of Transportation Test Center in Pueblo, Colo., and a comparison of experimental data from test runs of the LIMRV LIM guidance system with theoretical predictions using the survey data as an input to a mathematical model. While some deviations from predicted values were observed, in general the correspondence between experimental data and predictions were excellent.

Much of the material in this document is a result of joint efforts of personnel from the FRA, the MITRE Corporation, and the Garrett Corporation, the prime contractor on the LIMRV Program.

Muhlenberg, JD

Mitre Corporation, (MTR-6618) Tech. Rpt. Oct. 1975, 47 pp, 17 Fig., 1 Tab., 8 Ref., 1 App.

Contract DOT-FR-30015

ACKNOWLEDGMENT: FRA  
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11 147578

**THE AIR-CORE LINEAR SYNCHRONOUS MOTOR--AN ASSESSMENT OF CURRENT DEVELOPMENT**

The development of the air-core linear synchronous motor (LSM) is examined primarily on the basis of work done in the United States and Canada during the past five years. The outstanding performance features of these motors are demonstrated in terms of a simple theory, numerous design examples, and discussions of practical aspects. Comparisons to iron-core LSMs and linear induction motors are made. Also, the possibility of using air-core LSMs as an alternative to conventional railroad electrification techniques is pointed out.

Research sponsored by the FRA, Office of Research and Development.

Skalski, CA

Mitre Corporation, (MTR-7028) Final Rpt. FRA-OR&D-76-260, June 1976, 133 pp, Figs., Tabs., 59 Ref., 5 App.

Contract DOT-FR-54090

ACKNOWLEDGMENT: FRA  
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11 147838

**INVESTIGATION ON A MODEL A.C. LINEAR TRACTION MOTOR**

A laboratory model of a 3-phase linear induction motor for use in traction is designed and constructed with the primary winding in the moving part and the secondary forming the track. Two type of track designed for use at stations and between station are presented. The effect of the linear configuration of the motor on the flux distribution and its harmonic contents is investigated. An evaluation of the forces produced by the interaction of the currents in the primary and secondary circuits is made and the effect of the phase angles of currents on these forces is studied. A simplified equivalent circuit of the motor is presented. A method for measuring the linear speed of the motor is developed. The feasibility of using such a motor as a traction motor in the light of its overall performance and the cost of such a transport system is discussed.

Presented at the Conference on Electrical Transport, Adelaide, Australia, October 30-31, 1975.

Leung, WS (Hong Kong University); Mak, BK

Institution of Engineers (Australia) Preprint No. 75/8, 1975, pp 37-42, 18 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Institution of Engineers (Australia) Science House, Gloucester and Essex Streets, Sydney, Australia

11 148291

**NETWORK DYNAMICS IN A LARGE PERSONAL RAPID TRANSIT SYSTEM FAILURE**

The paper discusses the application of some control schemes and containment techniques and shows that methods exist which can reduce a patron's perception of vehicle failures to the category of minor nuisance. The operational workability of large PRT networks appears to be most sensitive to the most common system element the vehicle. In a well designed and maintained system, the remaining components are so relatively few or can be made so reliable as to be of minor concern. Methods exist which can minimize the operational impact of vehicle failures on the riding patron.

This paper was presented at the International Conference on Personal Rapid Transit held in Denver, Colorado, September 16-19, 1975.

Wade, RM (International Business Machines Corporation)

Colorado University, Denver Conf Paper Vol. 2, Paper 47, 1975, 13 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

11 148292

**SERVICE DEPENDABILITY EVALUATION AND DESIGN CONSIDERATIONS FOR AUTOMATED TRANSIT SYSTEMS**

The paper describes a method of evaluating service dependability and deriving system reliability and maintainability characteristics, and discusses some candidate reliability design features and failure management strategies.

This paper was presented at the International Conference on Personal Rapid Transit held in Denver, Colorado, September 16-19, 1975.

Ems, AF (TRW Systems Group)

Colorado University, Denver Conf Paper Vol. 2, Paper 46, 1975, 18 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

11 148294

**INFLUENCE OF THE SIZE AND NUMBER OF VEHICLES ON THE PERFORMANCE AND SERVICE QUALITY OF GROUP RAPID TRANSIT SYSTEMS**

The size of vehicles investigated ranges from 4 to 40 seats, the number of vehicles used is between 240 and 8. A demand-activated, fixed-route service was simulated. Parameters, such as waiting time and the passenger's trip velocity are used to characterize the user aspect, and such criteria as load factor of line and vehicles, vehicle kilometers, headway between consecutive vehicles and rate of vehicle stops at stations are employed as measures of the system's operating performance.

This paper was presented at the International Conference on Personal Rapid Transit held in Denver, Colorado, September 16-19, 1975.

Bahm, G (Karlsruhe University, West Germany)

Colorado University, Denver Conf Paper Vol. 1, Paper 18, 1975, 20 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

11 148295

**REVIVAL OF TRANSVERSE-FLUX MACHINES FOR HIGH-SPEED GROUND TRANSPORT**

The transverse-flux linear induction motor has opened up a new area of research for the solution to the problems of noncontact high-speed ground transport. It has increased the designer's challenge and will in time give him greater freedom to decide the shape and size of a motor for a freedom to decide the shape and size of a motor for a

Mahendra, SN *Electronics and Power* Vol. 22 No. 10, Oct. 1976, 5 pp, 6 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

11 148296

**INTERNATIONAL CONFERENCE ON PERSONAL RAPID TRANSIT, TECHNICAL PAPERS, 1975, VOLUMES 1 AND 2**

The volumes contain 43 papers presented at the Conference. They are grouped under the following session headings: new system program perspectives; evaluation of PRT applications; service concepts, system operation and control; social and community impacts; the urban structures of PRT; progress reports on European and Japanese systems; and safety, reliability and service dependability. An address list of the authors is included. Selected papers are indexed separately.

The Conference, sponsored by the University of Colorado, Center for Urban Transportation Studies, was held September 16-19, 1975 in Denver, Colorado.

Colorado University, Denver Proceeding 1975

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

11 148297

**SOME RELIABILITY, DEPENDABILITY AND SAFETY CONSIDERATIONS FOR HIGH-CAPACITY PRT SYSTEMS**

Safety is a consideration of major importance in the planning and implementation of an automated small-vehicle fixed-guideway transit system. Analysis of safety considerations necessarily entails identification of the spectrum of possible failure modes and the definition of procedural and design responses thereto. Procedural responses must consider not only the attainment of a high degree of passenger safety, but also a high level of service dependability; e.g., responses to emergency situations which result in significant service disruptions must be avoided if it is possible to do so

without significantly jeopardizing passenger safety.

This paper was presented at the International Conference on Personal Rapid Transit held in Denver, Colorado, September 16-19, 1975.

Olson, CL (Aerospace Corporation); Fuller, GH Fling, RB  
Colorado University, Denver Conf Paper Vol. 2, Paper 45, 1975, 19 pp, 19 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

11 148310

**REVIEW OF AUTOMOBILE CRASHWORTHINESS EXPERIMENTS WITH RESPECT TO PRT SYSTEMS**

The basic concept of crashworthiness relative to human transport systems is discussed. Experimental testing methodology which has been developed over several years is reviewed with special emphasis on automotive crashworthiness. Common elements between automotive and PRT system crashworthiness are identified and pertinent, existing experimental data noted. Methods that would permit future PRT system crashworthiness research to take advantage of automotive technology are considered and appropriate recommendations are developed.

This paper was presented at the International Conference on Personal Rapid Transit held in Denver, Colorado, September 16-19, 1975.

Miller, PM (Calspan Corporation); Shoemaker, NE  
Colorado University, Denver Conf Paper Vol. 2, Paper 42, 1975, 34 pp, 14 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202



12 052963

**WARNING DEVICES OTHER THAN DETONATORS.  
TECHNICAL SPECIFICATIONS CONCERNING LUMINOUS  
TORCHES EMITTING A RED FLAME. WARNING MEANS  
OTHER THAN DETONATORS**

The setting-up of the Specialist Committee B 92 was decided upon by the Control Committee of ORE at its meeting on 13th and 14th October 1964 in order to continue the study initiated by the Specialist Committee B 63 on direct warning systems for trains proceeding to a dangerous point. The first task entrusted to this new Committee was: to make a comparison between the torches now in current use, to derive from this comparison the optimum characteristics to be recommended for the torches. A technical specification for torches could be elaborated after comparisons and tests on torches of several Administrations, viz. the FS, SNCB, SNCF and even the JNR. This specification is discussed in part I of the present report. The second aim was the study of the general problem of warnings by less precarious means than detonators, particularly the study of means which could readily be used for the protection of the adjacent track in the case of derailments. The Committee has elaborated an analysis of "warning devices other than detonators", the results of which are given in the table of part II. The B 92 Committee finally considers that of all the warning means studied those which can be most quickly applied are the means based on telecommunication techniques between motive power units and fixed posts or between motive power units mutually, viz.: wireless connections, induction coupling with switches situated in the track or on posts arranged parallel to the track. Irrespective of the use to be made by the Administrations of these telecommunication means, the Committee B 92 considers it absolutely essential that priority should be given to the study of the problem incurred by the immediate warning of trains proceeding towards an obstacle.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrim Rpt. B92/RP 1/E, Oct. 1966, 7 pp, 4 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

12 093327

**CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM  
FOR MULTIMODAL ACCIDENTS (CHRISMA). (A  
REEVALUATION OF CHRIS FOR ALL MODES OF  
TRANSPORTATION)**

This report examines the need for improved technical and other information for meeting emergencies connected with the transportation of hazardous materials, particularly actual or potential chemical discharges regardless of mode. The Chemical Hazards Response Information System (CHRIS), under development by the United States Coast Guard to furnish in-depth guidance during emergencies involving waterborne transport, was seen as a likely prototype for other modes as well. Accordingly, a reevaluation of CHRIS has been conducted to determine the desirability of enlarging its scope to encompass all modes of transportation. It is concluded that the expanded system would indeed be beneficial in reducing losses to life, property, and the environment. Necessary modifications to CHRIS are would be composed of a decentralized organization providing response guidance on request to local emergency services personnel, a computerized hazard assessment system operated at Headquarters, and three reference manuals furnished to all response organizations.

Allan, DS Harris, GH  
Little (Arthur D), Incorporated, United States Coast Guard Final Rpt.  
ADL-C-74685-60-F, USCG-D-148-75, Apr. 1975, 133 pp

Contract DOT-CG-24655-A

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS Repr. PC, Microfiche  
AD-A016296/6ST, DOTL NTIS

12 093423

**A REVIEW OF VIOLENT MONOMER POLYMERIZATION: A  
SELECTED LITERATURE SURVEY**

In recent years, there have been a number of serious explosions involving violent monomer polymerizations. As a first step in the study of the causes

and mechanisms of these violent polymerizations, a 20 years literature search was performed for twelve monomers. The monomers included in the search were: acrylic acid, acrylonitrile, butadiene, 1, 3, ethylene, ethylene oxide, methyl acrylate, methyl-methacrylate, B-propiolactone, styrene, vinyl acetate vinyl chloride, vinylidene chloride. This document presents the results of the literature search, annotation and data extraction work. To maximize the utility of the findings from this effort, they are organized into the four sections that follow this introduction. Section II provides basic descriptive data on each monomer, their properties, consumption and a discussion of handling hazards. Section III is a matrix presenting the properties of the monomers. These two sections will serve as inputs for the assessments by violent polymerization risk. Section IV is the annotated risk-assessment work ahead, this bibliography will lead the user to the literature he needs. Section V is a standard listing citing all the references found in the literature search.

Harmon, M King, J  
Operations Research, Incorporated, United States Coast Guard Final Rpt.  
USCG-D-159-75, Oct. 1974, 142 pp

Contract DOT-CG-51765-A

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS Repr. PC, Microfiche  
AD-A017443/3ST, DOTL NTIS

12 130216

**HANDBOOK FOR INSURING TRAIN TRAFFIC SAFETY  
DURING TRACK WORK [Instruktsiia po obespecheniiu beopasnosti  
dvizheniia poezdov pri proizvodstve putykh rabot]**

This issue of "Instructions" establishes the order for track work production at the stages and stations, ensuring the complete safety of traffic. It is required for all track management workers, as well as other workers of transport services connected with train traffic and work production on the railroad track, and workers of the building organizations who carry out work on the railroad track. The chapters are: (1) Protection of track work by means of signals and signaling signs, and labor management; (2) The order or protection of work production locations at the stages; (3) The order of protection of work production locations at the stations; (4) The order of protection of places where interference to train traffic suddenly arises; (5) The protection of places along which trains are allowed with conductors; (6) The order of issuing warnings; (7) The order of work production and passage of trains at work sites; (8) The insurance of safety of train traffic during the production of track work in the "window" and during the operation of track machines; (9) The order of work production within the boundaries of the station; (10) The utilization of track motor cars, motorized locomotives, non-removable and removable hand cars, small track cars and other removable rolling units and their protection by means of signals; (11) The sequence of encountering trains; (12) The allocation of upper track structure materials; (13) The responsibility for traffic safety during track work. [Russian]

Abstract only is available in English, Original untranslated as of November 1976.

USSR Ministry of Railways 1973, 208 pp, 40 Fig., 18 App.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport,  
Moscow, USSR

12 133077

**TOXIC POINT DETERMINATION OF SELECTED HAZARDOUS  
MATERIALS**

'Toxic Point' is a term under consideration by the United Nations Group of Rapporteurs on the Packaging of Dangerous Goods. It is defined as the temperature at which the equilibrium concentration of vapor of a substance measured at 760 millimeters is equal to the LC50 of the substance. This is also referred to as the 'Temperature Threshold of Toxicity'. The report contains the 'Toxic Points' calculated for 57 substances. The calculations are shown together with the toxicity and vapor pressure data used therein.

Davis, RA Terpolilli, RN Back, KC  
Aerospace Medical Research Laboratory, Department of Transportation  
Final Rpt. DOT/MTB/OHMO-75/4, Dec. 1975, 12 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-250450/4ST, DOTL NTIS

12 133132

**MEASUREMENT OF TOXIC GASES AND SMOKE FROM AIRCRAFT CABIN INTERIOR MATERIALS USING THE NBS SMOKE CHAMBER AND COLORIMETRIC TUBES**

Seventy-five 'self-extinguishing' materials used in wide-bodied aircraft cabin interiors were tested in the National Bureau of Standards Smoke Chamber and analyzed for smoke and toxic gases in the combustion mixture. Concentrations of selected toxic gases were measured at regular intervals during the test, either directly from the chamber or from bag samples, using colorimetric detector tubes. Data analysis was facilitated by grouping the materials into usage designations and comparing the peak smoke and toxic gas concentrations. Despite the unknown magnitude of interference effects in the combustion mixture, detector tubes appear of offer a convenient and inexpensive method for identifying the presence of selected gases and approximating the relative gas yield of similar cabin materials. (Author)

Sarkos, CP

National Aviation Facilities Experimental Center Final Rpt. FAA-NA-75-54, FAA-RD-76-7, Mar. 1976, 62 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

AD-A023413/8ST, DOTL NTIS

12 133252

**AGENTS, METHODS AND DEVICES FOR AMELIORATION OF DISCHARGES OF HAZARDOUS CHEMICALS ON WATER**

Readily available chemical agents and methods advantageous for the amelioration of discharges of 30 representative chemicals on water were identified and evaluated. Existing devices advantageous for amelioration of spills of 8 floating hazardous chemicals were itemized and evaluated. Sorbents with high potential to ameliorate discharges of 13 miscible/soluble representative hazardous chemicals were identified and evaluated. Experimental tests performed supported evaluations made on the basis of information from literature search, consultations with contemporary researchers and industry representatives. Agents discussed for the representative 30 hazardous chemicals included sorbents, ion exchangers, precipitators, neutralizers, oxidizers, reducers, dispersers, collectors, solvents for extraction, coagulators chelators, gelling agents, biodegradation enhancers, sinking agents and forced dilution with water. Major conclusions were: that use of chemical agents for amelioration of discharges on water is feasible for 29 representative hazardous chemicals and the most versatile type of agent was sorbents, and that certain containment and collection devices, developed for oil spill control may be suitable, as manufactured or easily modified, for use in ameliorating discharges of representative floating hazardous chemicals. (Author)

Bauer, WH Borton, DH Bulloff, JJ

Rensselaer Polytechnic Institute Final Rpt. USCG-D-38-76, Aug. 1975, 284 pp

Contract DOT-CG-42759-A

ACKNOWLEDGMENT: NTIS

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AD-A024221/4ST, DOTL NTIS

12 136411

**HAZARD ANALYSIS--SPACE APPLICATIONS TO MASS TRANSIT**

The paper describes an aerospace hazard analysis method practiced by Martin Marietta for National Aeronautics and Space Administration (NASA)/United States Air Force (USAF) Shuttle programs and presents an example of how this method is directly applicable to a mass transit system. Emphasis is given to the incorporation of an active and methodical hazard analysis program from the earliest possible design phase of a new system through the initial revenue years of the operational system, including maintenance activities.

Presented at the Annual Reliab Maintainability Symp., Las Vegas, Nev., Jan. 20-22, 1976 sponsored by ASME and IEEE.

Mumma, GB (Martin Marietta Corporation); O'Halloran, WR  
Institute of Electrical and Electronics Engineers Proc Paper No. 1360, 1976, pp 251-256, 9 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

12 137030

**RAILROAD ACCIDENT REPORT: REAR END COLLISION OF THREE MASSACHUSETTS BAY TRANSPORTATION AUTHORITY TRAINS, BOSTON, MASSACHUSETTS, AUGUST 1, 1975**

On August 1, 1975, during the evening rush hour, southbound traffic on the Red Line of the Massachusetts Bay Transportation Authority in Boston backed up because of a train standing at a stop signal in the tunnel south of Charles Street Station. Train 1402, a four-car 'Bluebird' train, stopped at signal 236 because of the backup. Train 1604, a four-car 'Silverbird' train, was keyed by signal 234 and crashed into 1402 about 4:58 p.m. About 3 minutes later, a four-car 'Bluebird' train, 1431, crashed into the rear of train 1604. One hundred and fifty-four persons were injured; total damage to equipment was estimated to be \$425,000. The National Transportation Safety Board determines that the probable cause of this accident was the malfunction of the train-stop tripper and the subsequent operation of trains 1604 and 1431 in violation of the rules and in excess of the speed at which they could stop short of collisions in the available sight distances.

National Transportation Safety Board NTSB-RAR-76-6, Apr. 1976, 40 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-253360/2ST, DOTL NTIS

12 138064

**RP AND THE SMOKE HAZARD**

Reviews the pertinent topic of smoke generation from burning reinforced plastics materials and describes some of the smoke suppressant systems employed. The author sounds a warning of future legislation on this topic.

Oswitch, S *Reinforced Plastics* Vol. 20 N Apr. 1976, p 98

ACKNOWLEDGMENT: UIC

ORDER FROM: McDonald Publications of London Limited 268 High Street, Uxbridge, Middlesex UB8 1UA, England

12 139538

**PHASE 11 REPORT ON FULL SCALE FIRE TESTS**

This report presents an analysis of the results obtained in two tests of propane-laden DOT class 112/114A340 tank cars completely immersed in all-enveloping fires generated using JP-4 fuel. In the first test, an uninsulated car (RAX 201) ruptured at a pressure of about 335 PSIG after 24.6 minutes exposure to the fire. The safety valve incorporated on this car limited the maximum tank pressure to less than 350 PSIG, even in the all-enveloping fire. However, a rise in the temperature of the unwetted upper section of the steel shell to about 1200 degrees F precipitated rupture when the tank was about half full of liquid propane. In the second test, car RAX 202, insulated with a spray-on thermal protective coating, ruptured after about 93.7 minutes exposure to fire. With a heating rate averaging about 12,100 BTU/HR/FT to the 2nd power (43% of the 27.650 BTU/HR-ft to the 2nd power average from the first test), the longer time to rupture in this test is not solely due to insulation, as lower fire temperature and other variables played an important part. As in the first test, rupture was precipitated by a rise in unwetted shell temperatures to levels at which the shell strength could not withstand even the reduced tank pressures. As well as can be determined, it appears that the shell failure was initiated in an area which contained flaws or non-uniformities in the insulative coating.

Address requests to the Director of Operations Office, AAR.

Manda, LJ

Association of American Railroads Technical Center, (AAR-R-201) Res. Rpt. No. RA-11-6-31, Dec. 1975, 104 pp, Figs., 14 Ref.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

12 139539

**ANALYSIS OF NINE YEARS OF RAILROAD ACCIDENT DATA 1966-1974**

This report presents an analysis of Train Accident and Train Service Accident data for the years 1966 through 1974. The analysis was designed to identify the effects of such factors as inflation, reporting thresholds, changes in railroad traffic and bankrupt carriers on the trends of accident statistics. Accident cause categories were then ranked year by year based on an index which took account of both the frequency or number of accidents in each cause category and the severity of the accidents in that category.

Direct requests to the Office of Director, AAR.

Shulman, AE Taylor, CE

Association of American Railroads Res. Rpt. No. R-223, Apr. 1976, 136 pp, Figs., Tabs.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

12 141582

**AN OPERATIONAL DEMONSTRATION OF TRAILING END VISIBILITY ENHANCEMENT DEVICES FOR COMMUTER RAILROAD TRAINS**

This report describes the demonstration which compared under actual operating conditions various means of enhancing the visibility of commuter train ends. The visibility enhancement devices included in the demonstration were: 1) Xenon strobe lights; 2) Large and small red market lights; 3) Amber flashing beacons and 4) Various patterns of brightly colored paints and fluorescent/reflective tapes on car ends. Data concerning the visibility and other attributes of the above devices was collected by means of a series of questionnaires directed at groups of people considered to be significantly impacted by the devices. The groups surveyed were: 1) Train crew members; 2) Independent observers; 3) Residents along various rail rights-of-way; 4) Commuters and 5) Motorists. The survey results are discussed and the conclusions arrived at are used to make recommendations regarding which devices are most appropriate for inclusion in a regulation to govern the visibility enhancement of passenger train ends. In addition, performance specifications and guidelines for the use of these devices are given.

This demonstration was conducted by the Illinois DOT with the support and cooperation of the Federal Railroad Administration and three Chicago area commuter railroads: Burlington Northern, Chicago & Northwestern, Illinois Central Gulf.

Englund, DB

Illinois Department of Transportation Final Rpt. FRA-ORD-76-292, June 1976, 129 pp, 12 Fig., 5 Tab., 11 Ref., 1 App.

ACKNOWLEDGMENT: Illinois Department of Transportation

ORDER FROM: NTIS

PB-259901/AS, DOTL NTIS, DOTL RP

12 142245

**RMS: USING RMS TECHNIQUES FOR DESIGNING AND OPERATING HAZARDOUS FACILITIES**

The Risk Management System (RMS) collects information from engineering, operating and management personnel to identify potentially hazardous conditions. This information is used in risk analysis, problem resolution, and contingency planning. The resulting hazard accountability system enables management to monitor all identified hazards. Data from this system are examined in project reviews so that management can decide to eliminate or accept these risks in large, complex, high-energy facilities. These improvements are needed for increased cooperation among industry, regulatory agencies, and the public.

Fedor, OH (National Aeronautics and Space Administration); Parsons, WN (Boeing Company); Coutinho, J de S (Army Test and Evaluation Command) *ASME Journal of Mechanical Engineering* Vol. 98 No. 11, Nov. 1976, pp 21-25

ORDER FROM: ESL

DOTL JC

12 142257

**MEASURES TO REDUCE INFLAMMABLES IN PASSENGER VEHICLES**

Lightweight passenger cars of monocoque design with plastic interior finish and fixtures have provided improved riding quality and greater passenger comfort but can present fire hazards. An accident where fire produced not only high heat but also large quantities of smoke and toxic gases in a tunnel prompted the investigation. Measures for reducing the weight of flammable in four principal types of passenger cars have been investigated. Fire resistant materials have also been introduced. The propagation of fire and air circulation in different car designs remains to be studied.

Hoshiya, S Ishino, T

Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 47-48, 2 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute

ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

12 142301

**RAIL SAFETY TECHNOLOGY AND ATTITUDES TOWARD SAFETY TECHNIQUES [Eisenbahnsicherungstechnik und Sicherungstechnisches Denken]**

The author gives a brief description of railway safety technology and explains the notion of transport safety. He then shows how the "fail-safe" principle is used, reviews briefly the measures taken to protect against disturbances and human failings and safety conditions for circuits. [German]

Fenner, W *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 22 No. 4/5, 1975, pp 1037-42, 1 Tab., 5 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hochschule fuer Verkehrswesen — Friedrich List — Friedrich List Platz 1, Dresden 801, East Germany

12 142309

**DESIGNING COACHING-STOCK DOORS TO IMPROVE PASSENGER SAFETY [Die Gestaltung der Tueren von Reisezugwagen als Beitrag zur Sicherheit der Reisenden]**

No Abstract. [German]

Konitzer, H *Arztlicher Dienst DB* Vol. 37 No. 3/4, Mar. 1976, pp 31-37, 22 Fig., 7 Tab.

ACKNOWLEDGMENT: UIC

ORDER FROM: German Federal Railways, Documentation Service Central Office, Arnulfstrasse 19, 8 Munich, West Germany

12 142509

**EVALUATION OF RPI-AAR AND BRL TORCH FIRE TESTS OF TANK CAR INSULATIONS**

This report covers an analysis of torch fire (approximately 2150 degrees F flame temperature) tests of thermal shield systems of the insulated-jacketed type for railroad pressure type tank cars (class 112A, 114A). Similar systems were tested on both RPI-AAR laboratory equipment and on full scale equipment installed by the Ballistic Research Laboratory at the DOT Transportation Test Center at Pueblo. The systems tested comprised one inch of ceramic fiber and mineral fiber insulations of varying densities covered by an 11 gage steel jacket. The purpose of the tests was to compare the behavior of the two pieces of equipment with the objective of providing information which may prove useful toward establishing the RPI-AAR equipment as a final qualification tool for candidate systems. Although comparisons were not entirely consistent, the RPI-AAR apparatus showed reasonably good repeatability. The analysis shows it to be conservative; and this, combined with its economy of operation, confirmed the RPI-AAR belief that it has merit and should be adopted as the qualifying fire test for thermal shields.

This report documents Phase 11 of the Tank Car Research Project.

Porter, RW

Association of American Railroads Technical Center, (AAR-R-244) Res. Rpt. RA-11-8-36, Sept. 1976, 20 pp, 5 Ref.

ACKNOWLEDGMENT: Association of American Railroads Technical Center

ORDER FROM: Association of American Railroads Technical Center Director of Operations Office, 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

Rpt. Apr. 1976, 170 pp  
 ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-256518/2ST, DOTL NTIS

12 142527

**DESIGN FOR COACH SAFETY AND OTHER NEEDS**

All operators of public service vehicles have a moral responsibility to ensure the safety of their passengers. Yet there exists the constraints of what is legally required, what is safe, and what is economic. The author investigates some options.

Rowlands, D *Engineering* Vol. 216 No. 8, Aug. 1976, pp 556-559

ACKNOWLEDGMENT: British Railways  
 ORDER FROM: ESL

DOTL JC

12 142534

**MECHANICAL FAILURES AND PUBLIC EXPECTATIONS OF SAFE TRANSPORTATION**

Depending upon identifiable variables in circumstances, society may effectively require a range of performance between complete freedom from failure and general acceptance of repeated failures of a life-threatening nature. An attempt is made to classify the variables of circumstance which seem to govern public expectation and to create a structure in which the degree of freedom from mechanical failure which will be tolerated by the public can be reviewed. The possibility of using this structure for estimating public reaction to failure is discussed.

Presented at the 20th meeting of the NBS Mechanical Failures Prevention Group, Gaithersburg, Maryland, May 8-10 1974.

Wakeland, HL (National Transportation Safety Board)  
 National Bureau of Standards Proceeding Spec. Pub 423, Apr. 1976, pp 153-163, 2 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: National Bureau of Standards Technical Analysis Division, Gaithersburg, Maryland, 20760

12 142536

**ECONOMIC CONSIDERATIONS IN FAILURE PREVENTION**

Economic considerations normally determine if product failure prevention is justified by a producing firm. Failures represent a gap between expectations and performance. Both involve measurement and standards technology which the NBS can provide. However, economic analysis should be used to determine the conditions under which failure prevention is desirable. Examples of economically desirable conditions for failure prevention are provided.

Presented at the 20th meeting of NBS Mechanical Failures Prevention Group, Gaithersburg, Maryland, May 8-10 1974.

Morgan, HE  
 National Bureau of Standards Proceeding Spec. Pub 423, Apr. 1976, pp 107-116, 9 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: National Bureau of Standards Technical Analysis Division, Gaithersburg, Maryland, 20760

12 143214

**TRANSIT SAFETY AND SECURITY: A DESIGN FRAMEWORK**

The study is an analysis of transit crime data for the Southern California region. It examines safety and security deficiencies in transit design and recommends ways in which they can be ameliorated. The study contains the following: (1) development of security and safety objectives in the operation of major transit systems, (2) assessment of crime patterns and safety problems for selected regional transit corridors, (3) examination of the effectiveness of crime prevention by physical design of transit facilities, and (4) development of a reference document for safety and security design criteria in transit facilities. Some specific design areas examined include the following: park-and-ride facilities, parking structures; site planning and landscaping; illumination levels; passenger boarding safety; subway and elevated systems; station visibility; closure and monitoring; traffic and parking criteria; and the special needs of the elderly and handicapped.

Sponsored in part by Federal Highway Administration, Washington, D.C., and California State Dept. of Transportation, Sacramento.

Southern California Association of Governments, Federal Highway Administration, California Department of Transportation, (HPR) Final

12 143329

**RAILROAD ACCIDENT REPORT: CHICAGO TRANSIT AUTHORITY COLLISION OF TRAINS NO. 104 AND NO. 315 AT ADDISON STREET STATION, CHICAGO, ILLINOIS, JANUARY 9, 1976**

On January 9, 1976, at 8:06 a.m., Chicago Transit Authority (CTA) train No. 315 struck the rear end of train No. 104 while it was standing at the Addison Street Station platform in Chicago, Illinois. The impact forces extensively damaged the lead car of the moving train and the rear car of the standing train, and slightly damaged the other cars in both trains. Damage to the equipment and track was estimated to be \$267,000. Of the 381 passengers who were injured in the collision, 1 passenger died. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the motorman of train No. 315 to perceive standing train No. 104 at a sufficient distance to permit him to stop his train before striking No. 104. Contributing to the collision were the rule that permitted the operation of the train with the automatic train control and the cab signals inoperative, the lack of consistent enforcement of operating rules, the absence of flag protection against following trains, the failure of the train phone system to provide reliable communications, and the violation of the 25-mph speed limit required by Rule 178B.

National Transportation Safety Board NTSB-RAR-76-9, July 1976, 36p

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-256593/5ST, DOTL NTIS

12 143330

**RAILROAD ACCIDENT REPORT: DERAILMENT OF TANK CARS WITH SUBSEQUENT FIRE AND EXPLOSION ON CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD COMPANY NEAR DES MOINES, IOWA, SEPTEMBER 1, 1975**

At 4:00 p.m. on September 1, 1975, 17 cars of a Chicago, Rock Island and Pacific Railroad train, No. 81A31, derailed at the frog of a facing point switch on the main line near Des Moines, Iowa. The train was descending a 1-percent grade on a 1-degree curve. Eleven of the derailed cars contained liquefied petroleum gas (LPG). Fire and explosions ensued; the LPG was consumed and three persons were injured. The National Transportation Safety Board could not determine the cause of the initial derailment. The cause of the injuries and damages was the derailment of cars at or near the frog of the turnout and the subsequent tankhead punctures by disengaged couplers of the derailed tank cars.

National Transportation Safety Board NTSB-RAR-76-8, June 1976, 22 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-256592/7ST, DOTL NTIS

12 144085

**RAILROAD ACCIDENT REPORT: HEAD-ON COLLISION OF TWO PENN CENTRAL TRANSPORTATION COMPANY FREIGHT TRAINS NEAR PETTISVILLE, OHIO, ON FEBRUARY 4, 1976**

About 11:52 p.m. on February 4, 1976, Penn Central freight train NY-12 collided head-on with freight train BM-7 near Pettisville, Ohio. The 3 locomotive units and 21 cars of train NY-12, and the 4 locomotive units and 4 cars of train BM-7 were derailed. One locomotive unit of each train was destroyed and the derailed cars were heavily damaged. The two crewmembers in the lead locomotive of both trains were killed and one crewmember on each train was injured as a result of the collision. The estimated cost of damages was \$1,165,000. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the engineer to stop train NY-12 west of signal 3272E as required by signal indication, and the inability of the crew in the caboose of train NY-12 to take preventive action. As a result of its investigation, the Safety Board submitted three recommendations to the Federal Railroad Administration.

National Transportation Safety Board NTSB-RAR-76-10, Sept. 1976, 15 pp, 1 Fig.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS

12 144090

**LOCOMOTIVE/CABOOSE CRASHWORTHINESS**

This report presents the results of the Phase I study of the locomotive/caboose crashworthiness program and the proposed work for the Phase II investigation. The results of the Phase I study include the mechanics of train impact that lead to override, recommended action to control override and means of protection for locomotives and cabooses.

Sponsorship was provided by Federal Railroad Administration, DOT.

Tong, P

Transportation Systems Center, (DOT-TSC-FRA-76-18) Final Rpt.  
FRA-OR&D-76-289, Oct. 1976, 26 pp, 5 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-261110/AS, DOTL NTIS

12 145541

**MECHANICS OF TRAIN COLLISION**

A simple and a more detailed mathematical model for the simulation of train collisions are presented. The study presents considerable insight as to the causes and consequences of train motions on impact. Comparison of model predictions with two full scale train-to-train impact tests shows good correlation. Methods for controlling train motion and kinetic energy dissipation for the minimization of train collision induced damage are suggested.

(PC A04/MF A01)

Tong, P

Transportation Systems Center, Federal Railroad Administration Final Rpt. DOT-TSC-FRA-76-5, FRA/ORD-76/246, Apr. 1976, 74 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-258993/5ST, DOTL NTIS

12 147591

**RAILROAD ACCIDENT REPORT: AUTO-TRAIN CORPORATION TRAIN DERAILMENT ON THE SEABOARD COAST LINE RAILROAD NEAR JARRATT, VIRGINIA, MAY 5, 1976**

About 6:57 a.m., on May 5, 1976, 25 automobile carriers derailed from Auto-Train Corporation's northbound train No. 4 near Jarratt, Virginia. No one was injured. The train was traveling about 72 mph on the Seaboard Coast Line Railroad (SCL). The National Transportation Safety Board determines that the probable cause of this accident was an undetected, fractured, loose, and out-of-gauge wheel which struck the track structure. Dragging and incompletely released brakes caused the wheel to overheat at its tread; the overheating caused design stress patterns on the wheel to change and the wheel to fracture. The brakes did not fully release because of the train's length and because of the type of brake equipment used.

National Transportation Safety Board NTSB-RAR-76-11, Oct. 1976, 26 pp, Figs., 2 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

12 147714

**EVALUATION OF ACCIDENTS REPORTED ON FRA FORMS UNDER "CAUSE CODE NOT LISTED" CATEGORIES**

During the first part of 1975, 603 accidents were reported to the Federal Railroad Administration, FRA, on Form F6180-54 under the headings of "Cause Code Not Listed." The main objective of this study is to determine the nature of the causes to see if additional specific cause codes should be added to the FRA System. By adding eleven new codes (five from the Southern Railway), and reclassifying, two thirds of the accidents can be removed from the Miscellaneous Category.

Hawthorne, KL Popjoy, MA

Association of American Railroads Technical Center, (Project S-003) Res. Rpt. R-222, Mar. 1976, 28 pp, 3 Tab., 2 App.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

12 148255

**SYSTEM SAFETY APPLICATIONS TO TRANSPORTATION SAFETY**

The paper reviews existing system safety techniques and discusses their possible transfer and applicability to transportation safety. An application of system safety analysis techniques to an automobile braking system is presented.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976. See also RRIS 04 148248.

Horodniceanu, M (Polytechnic Institute of New York); Cantilli, EJ Shorman, M Pignataro, LJ

American Society of Mechanical Engineers Conf Paper Paper TE-2, 1976, 7 pp, 15 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

12 148312

**SAFETY ESTIMATES FOR URBAN TRANSIT SYSTEMS**

The paper presents the methodology and results of the safety analysis conducted for each of the transit alternatives being considered for Denver, Colo. It contains the historical data, methodology, and various assumptions used to develop the appropriate accident, and accident severity rates to forecast the safety status of various transit alternatives for the year 2000. The expected accident rates for the various concepts are summarized by hazard category and by the system's section. The comparison of total annual fatalities for the concepts is presented in terms of lives saved. The line haul sections of various concepts, and typical auto fatality rates are also compared to the domestic scheduled airline annual fatality rate.

This paper was presented at the International Conference on Personal Rapid Transit held in Denver, Colorado, September 16-19, 1975.

Moraq, D (De Leuw, Cather and Company); McGean, TJ  
Colorado University, Denver Conf Paper Vol. 2, Paper 43, 1975, 34 pp, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

13 052989

**BEHAVIOUR OF PANTOGRAPHS AND OVERHEAD EQUIPMENT AT SPEEDS HIGHER THAN 160 KM/H. STATIC TESTS CARRIED OUT BY THE SNCF (SINGLE-PHASE A.C. ELECTRIFICATION)**

In the context of ORE studies of overhead contact systems at high speeds, the SNCF carried out tests to determine the influence of various parameters on the fundamental characteristics of the contact system. In particular the influence of the following parameters has been examined: span length, conductor tensions, length and tension of stitch wires, spacing of droppers, contact wire sag, contact wire stagger, and system height (encumbrance). The maximum compliance is proportional to the span length and inversely proportional to the total conductor tensions. Considering the contact wire uplift relative to the horizontal plane between supports it appears that, with an upward force of 10 kp and a sag equivalent to 1/1000 of the span length, the different points of contact are more or less in a horizontal plane and this corresponds to an effective compliance factor of very nearly unity (see 1.3.3.1). The presence of a stitch wire increases minimum compliance to a variable extent depending on the length of the stitch. The different types of dropper configuration only have an effect in so far as the distance between adjacent droppers is increased. The frequency of oscillation is inversely proportional to the span length and proportional to the square root of the sum of conductor tensions. It is not influenced by the contact wire sag but it is slightly affected by the type of dropper arrangement and by the stitch wire.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways B84/RP 6/E, Oct. 1968, 25 pp, 14 App.

ACKNOWLEDGMENT: UIC

ORDER FROM: UIC

DOTL RP

13 053181

**HIGH POWER TRACTION CURRENT COLLECTION AT HIGH SPEED. COMPUTER PROGRAM FOR DETERMINING POWER TRANSMISSION IN OVERHEAD LINES**

This report describes a computer program developed by DR which permits calculation from the train timetable of the power required to be transmitted through overhead systems and the temperature increase at sub-stations. The computer results are compared with measurements made on the line Neukieritzsch and Gosnitz and good agreement is established.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways A129/RP 5/E, Apr. 1976, 21 pp, 9 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: UIC

DOTL RP

13 130027

**DESIGN, ASSEMBLY, AND OPERATION OF THE CATENARY NETWORK [Ustroistvo, montazh, i ekspluatatsiia kontaktnoi seti]**

This publication describes various forms of catenary assemblies, conductors, insulators, and materials. It provides information about the fundamental diagrams, assemblies, and components, mechanisms and appliances employed during operation of the catenary network. In addition, installation organization and planning, operation, repair, and refurbishing of the catenary network and operation of the energy feeding section are covered. The first chapter on catenary arrangements includes subsections on the suspension network, grounding, protective safety devices, cables, bearings, and feeding and sectioning. Basic mechanisms and assemblies covers locomotives, trolleys, tractors, and service vehicles utilized within the catenary system. Installation layout and supporting arrangements of the chain suspension are discussed. The section on operation and maintenance covers both capital and current repairs. A section on organization and planning of the operation of the energy feeding sections presents electrification and energy economics. Finally, fundamental scientific organization of production and labor is discussed. The book is written in accordance with the technical school program which prepares catenary network electricians, and may also be useful to students of the higher educational institutions, and the railroad transport technical schools. In addition, the book might be utilized by all workers concerned with the installation, operation, and

maintenance of alternating and direct current catenary networks. [Russian]

Abstract only is available in English, Original untranslated as of November 1976.

Fraifel'd, AV Markov, AS Tiurnin, GA

Transport Publishing House Textbook 1974, 416 pp, 296 Fig., 29 Tab., 23 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

13 130028

**OPERATION AND REPAIR OF THE CATENARY NETWORK OF ELECTRIC RAILROADS [Ekspluatatsiia i remont kontaktnoi seti elektricheskikh zheleznnykh dorog]**

This book analyzes operational and maintenance organization of direct and alternating current electrical railroad catenary networks. Included are present servicing and repair methods, leading labor practices, suggestions for complex technological operations, and generalized experience as to optimal interval spacing. Chapters cover servicing organization (e.g. equipment and staff, labor expenditure and planning, technical documentation and responsibility, energy dispatcher role in work crew organization); environmental influence on catenary network organization; interaction of catenary network with the current collectors; present makeup of catenary network; catenary conductor wear and tear (e.g. influencing factors, determining technology, analytical methodology, measures for increasing service life); protection of bearings and foundations from corrosion (e.g. reasons, reduction measures); protection of catenary network from short circuit currents, overloads, and burnouts; forms of damage and methods for restoration of catenary network (e.g. analysis and classification of damage, operational characteristics under difficult meteorological conditions). The book is intended for electricians and technical engineering workers concerned with electrical traction energy supply assembly operation. It can also be utilized as a learning textbook by students of the technical schools and institutes who are studying the construction and operation of catenary networks. [Russian]

Abstract only is available in English, Original untranslated as of November 1976.

Panfil, LS Bondarev, NA Belyayev, IA

Transport Publishing House 1972, 240 pp, 115 Fig., 6 Tab., 40 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

13 130029

**DESIGN OF THE CATENARY NETWORK OF ELECTRIFIED RAILROADS [Proektirovanie kontaktnoi seti elektrifitsirovannykh zheleznnykh dorog]**

This volume presents the planning organization of the catenary network, the choice of types and calculations for the catenary suspensions, and supporting and bearing constructions. Schemata for feeding, sectioning, and planning for the catenary on stations and stages are also presented. Examples of detailed information are: materials, meteorological conditions, optimal parameters of the catenary at high speed, trajectories for the current collector, and curve modification of the catenary depression. The section on elasticity includes the center span, supporting axles of compensated single-ply spring chain suspensions, and choice of height span. The book is intended for technical engineering workers concerned with the planning, construction, and operation of the catenary, and has been approved by the Main Administration Educational Institutions of the Ministry of Railroads. It is to be utilized as a learning textbook for students of higher learning institutions in the field of railroad transport in the specialization: "Railroad Transport Electrification". [Russian]

Abstract only is available in English, Original untranslated as of November 1976.

Fraifel'd, AV Porshnev, BG Vlasov, II

Transport Publishing House 1972, 320 pp, 160 Fig., 56 Tab., 21 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

13 130030

**SYSTEMS AND APPARATUS OF ELECTRIC POWER SUPPLY**  
[Sistemy i ustroistva elektrosnabzheniia]

This book describes schemata and arrangements for the electrical supply of various electrical traction systems. These electrified lines have increased sevenfold over the past eighteen years in the Soviet Union, and there is a continued emphasis upon the development and improvement of new technology in this field. Considered in this volume are the interaction of electrical rolling stock with the tractive and external electrical supply systems and the influence of tension conditions in the tractive network upon the operation of electrical locomotives and electric railroads on the whole. The following areas are also covered: fundamental calculation methods for the tractive electrical supply system, principles for choosing construction parameters, schemata for protection against short circuit current, and protection of contiguous lines and underground constructions from the influence of tractive currents. The present edition excludes the description of outdated electrotechnical equipment; new devices and arrangements which have been disseminated in the tractive electrical supply system have, however, been emphasized. The book has been approved by the Ministry of Railroads as a textbook for students of higher educational institutions for use in the specializations "Railroad Transport Electrification", "Electrified Railroad Rolling Stock", and "Electric Locomotive Construction". In addition, the book may prove useful to electrical engineers. The author of the first edition was awarded the Silver Medal. [Russian]

Abstract only is available in English, Original untranslated as of November 1976.

Prontarskii, AF

Transport Publishing House 1974, 272 pp, 157 Fig., 6 Tab., 61 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

13 130031

**INCREASE IN ENERGY QUALITY ON AC TRACTION SUB-STATIONS**  
[Povyshenié kachestva energii na tiagovykh podstantsiakh dorog peremennogo toka]

This book gives research results for processes of constructing and improving indicators of electrical energy levels in complex nonsymmetrical and nonsinusoidal alternating current traction road networks during established operating conditions; it also discusses characteristics of transformer electric locomotives under natural conditions, as well as in the presence of longitudinal and transverse (both regulated and nonregulated) compensation. The book is intended for scientific workers, graduate students, students in the higher educational institutions, as well as technical engineering workers concerned with problems of energy quality in the traction networks. The topics are as follows: (1) Experimental investigation of traction load quality. Energy quality under natural operational conditions of transformer electric locomotives. (2) Research into indicators of energy quality of transformer electric locomotives during absence of means for raising it; choice of methods and models for investigating energy quality; electrical locomotive currents and voltages when  $R$  does not equal  $0$ ; application of alignment methods and quick lowering for evaluation of solid mass of initial values of current, voltage, and ignition and commutation angles; formulas for the definition of basic indicators of energy qualities and transformer electric locomotive characteristics; characteristics of basic indicators of energy quality and energy estimates of electric locomotives; physical process of established operating conditions of transformer electric locomotives when  $R/X$  does not equal zero; characteristics of formation of electromotive force by electrical trains; utilization of established power of electric locomotive; established work conditions of transformer electric locomotive and its limitations; voltage losses in primary circuit of electric locomotives in the traction network. (3) Established operating conditions of transformer electric train in presence of transverse capacitive compensation; currents and voltages by phases; definition of initial values of currents, voltages, and commutation and ignition angles; evaluation of basic indicators of energy level of electric trains. (4) Energy quality of transformer electric train in presence of capacitive compensation; basic indicators of transformer electric locomotives. (5) Problems of application of reactive regulated batteries for raising energy quality on AC roads; three-phase regulated reactive batteries; single-phase regulated reactive batteries with voltage regulated by modulus and amplitude; three-phase/two-phase regulated reactive batteries; efficient regulated reactive battery arrangements; regulated numbered transformer

and elements of the regulated reactive battery control device. (6) Technical economic effectiveness of applying statistical sources of reactive power in traction networks; principles of evaluating technical-economic effectiveness of sources of reactive power. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Mamoshin, RR

Transport Publishing House 1973, 224 pp, 138 Fig., 9 Tab., 121 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

13 130032

**AUTOMATION AND REMOTE CONTROL OF ELECTRIC POWER SUPPLY APPARATUS**  
[Avtomatika i telemekhanika elektrosnabzhaushchikh ustroistv]

This book presents fundamental information about the elements and construction principles of telemechanic and automatic assemblies of electrical railroad electric supply arrangements; present systems are described in detail. The main chapters of the book include the following. (1) Information, signals, transformation, and transmission (e.g. discrete and continuous signal quantization, physical characteristics, spectra, detection of modulation oscillations, principles of interference-free codification); (2) Assemblies and elements of automatic and telemechanic arrangements (e.g. electrical diagrams, cold cathode thyratrons, electromechanical relay and pitch selectors, magnetic elements with rectangular hysteresis loop); (3) Functional and transformational schemata (e.g. impulse distributors, encoders, decoders); (4) Feeding line automatics (e.g. automatic reclosing of transmission lines, feeders, short circuit points, sectioning posts); (5) Automatic arrangements of transformers, transformational assemblies, and auxiliary arrangements (e.g. mercury rectifier cooling, silicon rectifier commutation); (6) Construction principles of telemechanics arrangements; (7) EST (Ch)-62 electronic remote control system with frequential channel distribution (e.g. technical characteristics, telesignalization assemblies, transmitting arrangements); (8) EST-(V)-62 electronic remote control system; (9) Telemechanics communication channels (e.g. high frequency channels on electrical transmission lines and power ramification circuits); (10) Elements and apparatus of telemechanic communication channels (e.g. electrical filters, amplitude limiters, low frequency harmonic oscillation generators); (11) Fundamental information on installation, repair, and operation of automatic and telemechanic arrangements. This book has been approved by the main administration of the Ministry of Railroads for use as a textbook for railroad transport technical schools in the specialization: "Energy Supply and Railroad Transport Energy Economics." It may also prove useful for technical engineering workers connected with the planning and operation of telemechanic and automatic arrangements. [Russian]

Abstract only is available in English original untranslated as of November 1976.

Dmitrievskii, GV Ovlasiuk, Via Suchoprudskii, ND

Transport Publishing House 1970, 264 pp, 249 Fig., 15 Tab., 3 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

13 130033

**AUTOMATION AND REMOTE CONTROL OF THE POWER SUPPLY APPARATUS OF ELECTRIC RAILROADS**  
[Avtomatizatsiia i telemekhanizatsiia ustroistv energosnabzheniia elektricheskikh zheleznnykh dorog]

This book has been written according to the program of the course: "Fundamentals of automatics, automation, and remote control by means of electrical railroad electrical supply arrangements", which is studied at the faculties of "Railroad Transport Electrification" at the railroad transport institutes for the specialization: "Electrical Railroad Energy Supply". The book examines the fundamentals of automatics and telemechanics, as well as the automated and telemechanized arrangements employed for the control of electric railroad electrical supply systems. Basic attention is drawn to the elements, assemblies, and schemata of arrangements found in the widest utilization in automatics and telemechanics of electrical railroads. The problems of transfer of telemechanized information are closely examined. Principles of construction and utilization are continually cited along



with the description of concrete mechanisms. The book is approved by the Main Administrative Educational Institutions of the Ministry of Railroads as a textbook for higher educational railroad transport institutions, and may also be utilized by technical engineering workers concerned with the planning and operation of electric railroad electrical supply arrangements. [Russian]

Abstract only available in English, original untranslated as of November 1976.

Beneshevich, II Ovlasiuk, VIa Lisitsyn, VM Suchoprudskii,  
ND Shalimov, MG  
Transport Publishing House 1968, 352 pp, 287 Fig., 27 Tab., 23 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

### 13 130035

**RULES OF SAFETY TECHNIQUES AND INDUSTRIAL SANITATION DURING OPERATION OF THE CATENARY NETWORK OF ELECTRIFIED RAILROADS AND POWER SUPPLY SYSTEMS FOR THE AUTO-BLOCKING [Pravila tekhniki bezopasnosti i proizvodstvennoi sanitarii pri ekspluatatsii kontaktnoi seti elektrifitsirovannykh zheleznykh dorog i ustroystv elektrosnabzhenia avtoblokirovki]**

These "Rules" apply to the AC and DC catenary networks, junction station arrangements, transformer substations, and the automatic blocking system. They also are concerned with aerial lines of all tensions, 6-10 kV. aerial traction lines for electrical energy supply of the automatic blocking system, and centralized dispatching with cable lines suspended on separately standing bearings. The "Rules" themselves cover areas of application, personnel requirements, training of range personnel in safe operating methods, verification of such knowledge, general requirements for work preparation and accomplishment commutation, protection and assembly, technical organizational measures insuring operating safety. The work execution itself is carried out at a height; under full or withdrawn tension; on aerial outlet lines; with protective and operational grounding; reverse current wave guides and conductors; with measuring beams used during deflection of catenary insulators; with isolated beams; on horn discharges without tension removal. Cables are installed in the central anchoring posts and elastic cross braces are used; work may be carried out by ascending rolling stock to roof in order to inspect current collectors. Work may also be done on isolated cantilevers; on section disconnecting switches without tension removal; on removable insulated towers, on insulated platforms; on installation trolleys and rail cars; and on insulated lean-to ladders. Work on the automatic blocking system traction lines incorporates switching; aerial lines; portable transformers; safety measures regarding elevating machines and hoisting devices; clearing course of trees; digging trenches; and mounting supports are all covered in this section. The appendices provide the everyday sanitation maintenance indications: first aid to victims of electric shock and other accidents; electrotechnical personnel crews; commands and information regarding commutation of disconnecting switches and contact breakers; norms and test periods of current mechanisms and apparatus, work fulfillment by verbal or telephone disposition and radio; work execution disposition; and finally, order, information, and declaration forms. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1974, 128 pp, 14 Fig., 1 Tab., 10 App.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130036

**RULES FOR THE PROTECTION OF WIRE COMMUNICATION ARRANGEMENTS FROM THE INFLUENCE OF DIRECT CURRENT ELECTRIC RAILROAD TRACTIVE NETWORK. PART I [Pravila zashchity ustroystv provodnoi svyazi ot vlianiia tiagovoi seti elektricheskikh zheleznykh dorog postoiannogo toka. Chast 1]**  
The "Rules" were first published in 1948; however, new theoretical and experimental research on the influence of direct current electric railroads on conductance communication chains carried out in the CNIIMPS and CNIIS, as well as the need for practical protection of such arrangements, led

to the necessity for reworking the active "Rules". The new "Rules" emphasize the dependency of noise tension in communication chains on dissymmetry of phase tensions in high voltage lines feeding the rectifying arrangements of tractive substations, and gives schemata for new improved sliding arrangements. This led to the formation of a new methodology for calculating interference tensions inducted in the tonal frequency chains from harmonic components of the rectified current in the tractive network; corrected norms for interference tensions are given. Part I of "Rules" relates to the protection of the tonal frequency range of the tonal network. For the lowering of interference influences in high frequency communication channels (pending the publication of Part II) the present Part I advises the turning on of a condenser with 10 microfarad capacitance between positive busbar of each mercury arc rectifier and the external circuit of the substation grounding. Contents include: definition and application of rules; fundamental concepts and definitions; dangerous and interference currents; norms of interference tensions and currents; requirements for electrical traction mechanisms; basic indications for calculation of interference tensions and currents and calculation formulas; and finally, basic indications for calculation of tensions and formulas conditioned by galvanic influence. The nine appendices provide additional, specialized information. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways, USSR Ministry of Communications 1969, 46 pp, 25 Fig., 13 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130037

**MAINTENANCE RULES FOR CATENARY NETWORK OF ELECTRIFIED RAILROADS [Pravila soderzhanii kontaktnoi seti elektrifitsirovannykh zheleznykh dorog]**

These rules are intended for workers concerned with operational maintenance of catenary network arrangements, transmission lines, and aerial lines; and can also be utilized by students of the higher educational institutions and technical schools. Specifically, the pamphlet covers direct and alternating current catenary network arrangements; 6-35 kV transmission lines, operated by the energy feeding section, installed upon catenary network and separately standing bearings; and aerial lines of tension as high as 400 v mounted on the catenary network bearing. The rules are not intended for transmission lines of the automatic blocking system. The contents include: technical norms for operational maintenance of catenary network arrangements transmission lines and aerial lines; types of catenary suspensions; conductor parameters; wear and tear; distribution of conductors; isolators; cross braces; locks and electrical connectors; central anchoring; conductor inserts and joints; load compensators and conductor anchoring; grounding; protections against short circuit currents, overload, and burnouts; intersection of catenary network conductors by conductors of other aerial lines; protective arrangements and safeguards. The appendices cover; tables for determination of wear and tear of the catenary conductor independently of cross section height measurement methods and analysis of wear and tear of catenary conductors on electrified railroads: Finally, rules of operational maintenance and protection against corrosion of concrete and iron bearings of the catenary network. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1968, 97 pp, 13 Fig., 17 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130038

**TECHNICAL INFORMATION, INDUSTRIALIZATION AND MECHANIZATION OF INSTALLATION WORK DURING RAILROAD ELECTRIFICATION. (EXPERIMENTAL WORK OF THE "TRANSELECTROASSEMBLY" COMBINE) [Tekhnicheskaiia informatsiia, Industrializatsiia i mekhanizatsiia montazhnykh rabot pri elektrifikatsii zheleznykh dorog (opyt raboty tresta "Transelektromontazh")]**

This pamphlet describes the industrialization and mechanization of installation operations during railroad electrification. The utilization of standard

plans of unified elements and components of the catenary network and traction substations, as well as factory manufacture of miscellaneous equipment and assemblies and their subsequent installation at the construction area, insure the industrialization of structural installation operations during railroad electrification. The manufacture of construction elements and units of catenary network equipment at factories of the "Transelectroassembly" Combine immediately decreased work input on the objectives and allowed a shortening of the "opening" times for work production. This has great significance for high density operation of trains on electrified lines. The work input on the structural assembly work for the construction of traction substations was also significantly reduced. At the beginning of the 1950's manufacture of individual units and constructions for installation at the traction substations began at factories. The "Transelectroassembly" Combine proposed that the "Transelectroplan" and the Ljubeckii factory develop the first complete AC traction substation with operational alternating current. This pamphlet includes figures covering general overviews of the complete DC remote control substation with silicon rectifiers, DC remote control sectioning post, transformer substation junction station grouping point, and the AVGM railcar in its catenary network installation. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Tkalic, AD

USSR Ministry of Transportation Construction 1971, 16 pp, 7 Fig., 3 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Institute of Transportation Construction USSR Ministry of Transportation Construction, Moscow, USSR

13 130039

**SURVEY INFORMATION, TECHNICAL PROGRESS IN RAILROAD ELECTRIFICATION [Obzornaia informatsiia.**

**Tekhnicheskii progress v elektrifikatsii zheleznykh dorog]**

The major direction of development during the 1971-75 five-year plan is the increase in passage and carrying capabilities of railroads. The freight movement will rise by 22%. In order to accommodate this, 8000 km. of second track will be built, 6-7000 km. electrified, and work will continue on equipping railroad lines with automatic blocking and centralized dispatching. 5-6000 km. of new lines will be constructed, and the weight and speed of motion of trains will also increase. As of January 1, 1971 there were over 35,000 km. of electrified railroads in the Soviet Union, as well as 78,500 km. of railroads serviced by diesel locomotives. This present issue provides information on the following topics: (1) Improvement of construction and maintenance technology of the catenary network; (2) Industrialization of construction and installation of the traction substations; (3) Development of automation and remote control; (4) Mechanization of labor for maintenance of main cable communication lines; (5) Mechanization of labor for maintenance of aerial and cable lines; and finally (6) Further improvement of energy supply arrangements. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Gruber, LO

USSR Ministry of Transportation Construction 1972, 40 pp, 15 Fig., 7 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Institute of Transportation Construction USSR Ministry of Transportation Construction, Moscow, USSR

13 130040

**INTRODUCTION OF SEMI-CONDUCTOR CONVERTERS INTO TRACTION SUBSTATIONS (FROM THE BOOKLET ELECTRIFICATION AND ENERGY SYSTEMS. VOL. 4, 70)**

**[Vnedrenie poluprovodnikovykh preobrazovatelei na tiagovykh podstantsiiakh (Elektrifikatsiia i Energeticheskoe Khoziaistvo, 4(70))]**

This issue presents three reports. (1) "The Operational Experience of Semiconductor rectifiers on the West-Siberian railroad". There is occurring at present on the West-Siberian railroad a widespread replacement of mercury rectifiers with semiconductor rectifiers. As the year of 1972 approached over 50% of the rectifiers in operation were semiconductor rectifiers. In the article the operating reliability of semiconductor rectifiers is compared with that of mercury rectifiers. The automation system is described, including ventilation, dependent upon the valve's body tempera-

ture and protection of the transformer assembly from overloads. (2) "Adjustment of power case phases of the VIPE-I type inverted rectified converter". Shown are the methods for adjusting the type VIPE-I inverted rectifier unit as worked out on the Sverdlovskii road. Adjustment of power case phases of type VIPE-I converters is included in the verification of the correspondence of the installation to the schemata, the distribution of reverse current between the sequentially coupling thyristors, the formation of impulses by discharge cascades and the presence of these impulses on the controlling electrodes of all power case thyristors, and the distribution of current between the parallel coupling thyristors in realizing the protective adjustment against valve flashover and overload. (3) "The Condition and Perspectives for Introduction of Semiconductor Converters on Traction Substation of Electrified Railroads. This is a short exposition of reports and recommendations accepted by participants in the technical scientific conference meeting in September 1971 in the Pavilion "Transport USSR" of the All-Union Exposition of National Economy Accomplishments. [Russian]

Abstract only is available in English, original untranslated as of November 1976. USSR Ministry of Railways and the Central Scientific Research Institute of Information, Technical-Economic Research and Railway Transportation Propaganda (Ts.N.I.I.T.E.I.)

Ts.N.I.I.T.E.I., USSR Ministry of Railways 1974, 34 pp, 8 Fig., 1 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ts.N.I.I.T.E.I. Raushskaia Nab 4, Moscow 113035, USSR

13 130041

**NEW DEVICES FOR AUTOMATION AND TELEMCHANICS (FROM THE BOOKLET ELECTRIFICATION AND ENERGY SYSTEMS. VOL. 6, 72) [Novye ustroistva avtomatiki i telemekhaniki (Elektrifikatsiia i Energeticheskoe Khoziaistvo, 6(72))]**

This issue presents (1) a description of the central dispatching point which realizes the centralized control for direct and alternating current conditions of electrified lines, remote control of reserve feeding arrangements, and the realization of direct telephone communication of electrification and energy economy service apparatus road control by means of the energy feeding section dispatchers. New to the central dispatching point is the signaling of the presence of tension in the catenary network feeder cables, the relay junctions of remote control signals, and also the utilization of electroluminescent panels. (2) A description of the new remote control system "Lisna" in which silicon assemblies are maximally utilized; these have high operational reliability. For the remote control by means of energy feeding objectives in this system mosaic-type switchboards are applied. (3) The description of new assemblies for the checkup of toroidal magnetic transformers with rectangular hysteresis loops, silent discharge thyratrons, semiconductor transistors and diodes, and type MO-70P oscillograph. (4) A description of electric protection, the first phase of which is predestined for the feeder cables feeding the station and depot roads, and the second for the feeder cables feeding the section between stations. High-speed action of the electronic protection system is attained by employing discharge and measurement instruments characterized by lower acting time, exclusion from the protective system of intermediate relays, employment of no-contact, disconnecting, high voltage contact breakers and automatic blocking system between adjacent circuit breakers of the substations and sectioning posts. (5) A description of the rapid-acting protection system with output thyristor unit supplemented by current relay with magnetically controlled hermetically sealed contact. The high-speed action of protection and reliability and simplicity of construction allow its utilization not only for the protection of station and depot feeder cables of the catenary network, but also for the protection of all catenary network feeder cables, DPR lines, basic transformers, compensating arrangements, and all other connections. [Russian]

Abstract only is available in English, original untranslated as of November 1976. Produced by U.S.S.R Ministry of Railways and the Central Scientific Research Institute of Information Technical-Economic Research and Railway Transportation Propaganda. (Ts.N.I.I.T.E.I.)

Ts.N.I.I.T.E.I., USSR Ministry of Railways 1972, 41 pp, 16 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

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13 130042

**MAINTENANCE OF CATENARY NETWORK DEVICES (FROM BOOKLET ELECTRIFICATION AND ENERGY SYSTEMS. VOL. 4, 78) [Obsluzhivanie ustroystv kontaknoi seti (Elektrifikatsiia i Energeticheskoe Khoziaistvo, 4 (78))]**

This issue presents results of the experiments for maintenance which were carried out on the Novosibirsk catenary network energy supply section; the new maintenance system with utilization of mechanized columns is also examined. The contents include the choice of a rational maintenance system for the electric network, the determination of damage of the catenary network, the determination of optimal periods between installation, and composition and periodicity of preventive work carried out on the energy feeding system. [Russian]

Abstract only is available in English, original untranslated as of November 1976. Produced by U.S.S.R. Ministry of Railways and the Central Scientific Research Institute of Information, Technical-Economic Research and Railway Transportation Propaganda. (Ts.N.I.I.T.E.I.)

Ts.N.I.I.T.E.I., USSR Ministry of Railways 1973, 30 pp, 3 Fig., 4 Tab.

ACKNOWLEDGMENT: FRA

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13 130043

**CHECKING OUT AND TUNING OF THE COMMUNICATION CHANNELS FOR TELEMECHANICS AND AUTOMATIC BLOCKING SYSTEMS; OPERATIONAL EXPERIENCE OF THE "SEIMA-3" APPARATUS (FROM THE BOOKLET ELECTRIFICATION AND ENERGY SYSTEMS. VOL. 5, 79)**

[Proverka i naladka apparatury kanalov svyazi telemekhaniki i teleblokirovki, opyt ekspluatatsii apparatury tipa "Seima-3" (Elektrifikatsiia i Energeticheskoe Khoziaistvo, 5 (79))]

This issue of "Electrification and Energy Economics" presents the experiment carried out by the Moscow mechanical energy enterprise; and upon its basis presents a recommendation for adjustment of the apparatus of communication channels for the remote control arrangements of the EST-62, Lisna, and automatic blocking systems. In addition, the issue presents the experiment on apparatus operations of the "Seima-3" system; this is installed upon three alternating current tractive substations of the Odessa-Kishinev railroad. Fundamental arrangements are given which were proposed and adopted by the road laborers in order to improve the performance of the electronic protection system of "Seima-3". The principle system of transformers on thyristors predestined for reserve feeding of the "Seima-3" apparatus is described. [Russian]

Abstract only is available in English, original untranslated as of November 1976. Produced by U.S.S.R. Ministry of Railways and the Central Scientific Research Institute of Information, Technical-Economic Research and Railway Transportation Propaganda. (Ts.N.I.I.T.E.I.)

Ts.N.I.I.T.E.I., USSR Ministry of Railways 1973, 44 pp, 21 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ts.N.I.I.T.E.I. Raushskaia Nab 4, Moscow 113035, USSR

13 130044

**AMPLIFICATION OF THE POWER SUPPLYING SYSTEMS AND OPERATION OF PROTECTIVE SYSTEMS IN AUTOMATION AND TELEMECHANICS FROM THE BOOKLET ELECTRIFICATION AND ENERGY SYSTEMS NO. 3 (83) [Usilenie ustroystv energosnabzheniia i ekspluatatsiia apparatury zashchity, avtomatiki i telemekhaniki- Elektrifikatsiia i Energeticheskoe khoziaistvo No. 3(83)]**

This report consists of eight studies. (1) "Reinforcement of energy feeding arrangements" describes the experiments in this area carried out on the East-Siberian road. (2) "Protection of the catenary network during direct current section reinforcement" covers problems of the catenary network concerned with increase in loads and reliability requirements for the energy supply arrangements, as well as the need for estimating recuperative currents during the choice of protective settings. Included are descriptions of new sectioning post arrangements and forms of protection employed on the East-Siberian road. (3) Areas of utilization and operational experience of linear capacitance compensation in alternating current tractive networks: possible variations of switching on the linear capacitance compensation in A.C. current tractive network with 27.5 kV. tension, and influence of these variations on substation tractive busbars. On the basis of research

and operational experience it is determined that the most rational utilization areas are in energy feeding arrangements of feeder cable sections and optimization of operating conditions of the tractive networks. (4) "Arrangements of linear capacitance compensation in A.C. tractive networks"; parameters and definition of fundamental elements as employed on tractive substations and sectioning posts of principle linear capacitance compensation circuits. (5) "Linear capacitance compensation protection and automatics" presents reworked and installed unbalanced voltage protection of high sensitivity power capacitors; by-pass apparatus utilizing fast-acting VAB-28 circuit breakers on the short circuit principle, and a system of control, automatics, and linear capacitance compensation protection. (6) "Operation of parallel compensation arrangements" covers protection from commutational overloads and presents methods for driving the reactor. (7) "Some results of adjustment and operation of automatic blocking arrangements and electronic protection of feeders". (8) "Remote control of energy feeding objectives along the line of energy dispatching" shows characteristics of apparatus for remote control of stations, sectioning posts, and parallel junction points, including emergency signal transmission. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

*Electrification and Energy Systems* 1974, 55 pp, 14 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ts.N.I.I.T.E.I. Raushskaia Nab 4, Moscow, USSR

13 130045

**PROGRESSIVE MAINTENANCE METHODS AND EQUIPMENT RELIABILITY EVALUATION OF THE TRACTIVE SUBSTATIONS. CURRENT HARMONIC LIMITATION IS PARALLEL COMPENSATION SYSTEMS FROM THE BOOKLET ELECTRIFICATION AND ENERGY SYSTEMS NO. 5 (85)**

[Progressivnye metody obsluzhivaniia i otsenka nadezhnosti oborudovaniia tiagovykh podstantsii ograniichenie garmonik b ustroistakh parallelnoi kompensatsii-Elektrifikatsiia i Energeticheskoe Khoziaistvo No. 5 (85)]

This issue expounds upon the experimental research on the energy-feeding section relative to maintenance methods of the tractive substations carried out by the operational maintenance personnel; maintenance organization of the tractive substations is done by means of interconnecting and complex methods. In addition, the experimental work carried out on the Kranolimarsk energy feeding section of the Donec road according to standardized instructions is summarized. An estimate of the reliability of the tractive substation network is given, and methods for limiting the harmonic curve of the current of the parallel compensation mechanisms are enumerated. An objective analysis of the functional components of the tractive substation system is given. Special attention is paid to an evaluation of the feeder contact breaker operations. The operation of the parallel capacitance compensation mechanisms with approximately 150 hertz frequency tuning in the presence of the third harmonic curve under an external energy supply system current is described. Finally, the study reveals methods employed upon the Gor'kovskii road for the definition of the frequency tuning of parallel capacitance compensation mechanisms being utilized in the presence of certain useful power and parameter conditions of the third harmonic tension curve. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

*Electrification and Energy Systems* 1974, 52 pp, 6 Fig., 7 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ts.N.I.I.T.E.I. Raushskaia Nab 4, Moscow, USSR

13 130046

**ELECTRONIC PROTECTION OF HIGH VOLTAGE LINES OF THE AUTOMATIC BLOCKING SYSTEM FROM SHORT CIRCUIT CURRENTS; FROM THE BOOKLET ELECTRIFICATION AND ENERGY SYSTEMS NO. 6(86)**

[Elektronnaiia zashchita vysokovol'tnykh linii autoblokirovki ot tokov korotkogo zamykaniia-Elektrifikatsiia i energeticheskoe khoziaistvo 6(86)]

This issue provides a description of four individual projects. (1) Electronic protection of high voltage lines of the automatic blocking system from short circuit currents. A full voltage recycling period on the damaged line under such protection occurs within the boundaries of 0.6 to 0.86 seconds during

various rotations of automatic and repetitive connection of the reserve. The operating time of the full cycle electronic protection is much shorter than the overlapping signal delay. (2) The statistical voltmeter integrator allows the definition of a mean voltage value histogram in the electrical network for a determined time interval for all trains during their passage through the instrument controller stopping points. The experimental model of the statistical integrator voltmeter passed the operational tests on the Kurskij energy feeding section of the Moscow road and the Kuzneckij energy feeding section of the Kujbyshevskaja road and displayed good results. (3) Increasing the operational reliability of type VIPE-1 inverted rectifier units. The work carried out by the road electrotechnical laboratories and the energy supply sections is described. (4) Variation of the scheme and parameters of tractive substation smoothing filter No. 2; this reveals the results of theoretical and experimental research into the influence of the test filter on the performance of the No. 2 smoothing filter. On the basis of analysis of the required partial characteristics of the filter, changes in its scheme and parameters were carried out. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways, Ts.N.I.I.T.E.I. 1974, 39 pp, 20 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Ts.N.I.I.T.E.I. Raushskaia Nab 4, Moscow 113035, USSR

### 13 130047

#### ELECTRONIC ENGINEERING IN THE AUTOMATION AND REMOTE CONTROL OF ELECTRIC TRACTION SYSTEMS

[Elektronnaia tekhnika v avtometike i telemekhanike elektratiagovykh ustroystv]

Electric apparatus has in the past several years seen wide use in automatic, remote control, and protection systems on USSR electrified railroads. These articles encompass problems of finding and researching protective methods against short circuit currents, elements and mechanisms of automation, as well as special apparatus for their control. One group of articles illuminates problems in the telemechanization of electric traction arrangements; the definition of boundaries of energy dispatching circles, remote measuring of trains, insurance of stability of transmission of telemechanized information along the non-shielded cable and high voltage electric transmission lines. The specific topics include electronic systems of automation and protection of signaling, centralizing, and blocking arrangements; investigatory work into differential protection from damage on the protection line; research into electronic differential protection during external short circuits; output thyristor elements for electronic devices of automation arrangements and relaying of the traction substations; devices of automation arrangement and relaying of the traction substations; devices for verification of automatic, remote control, and protection arrangements; stabilization of temperature conditions of electronic mechanisms of automated and remote control systems; definition of optimal dimensions of energy dispatching section on electrified railroads; device for searching of short circuit points of AC traction network and high voltage transmission lines of the automatic blocking system; choice of minimal frequency of the transformer fed by rectified current; line amplifiers for remote control and automatic blocking communication channels; remote measurement of and current in energy supply system; dynamic characteristics of numbered frequency meters; regulation on busbars of traction substations according to average losses in the tractive circuit; electric locomotive remote control system located in middle of stock; system of suppression of impulse interferences in collecting circuit during transmission of information along the catenary network; electronic arrangement for deformation of effectiveness of action of the train brakes; [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 467, 1972, 168 pp, 95 Fig., 12 Tab., 43 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130049

#### RESEARCH INTO POWER SUPPLY DEVICES AND RAILROAD ROLLING STOCK [Issledovanie ustroystv elektrosnabzheniia i podvizhnogo sostava zheleznykh dorog]

The following eleven reports are presented in this pamphlet: (1) Calculation of the degree of strengthening of the harmonic components of electric trains in traction networks; (2) Calculation of power of conductance compensation sections; (3) Analysis of interference current on DC traction substation with supplementary regulatory thyristor converter; (4) The influence of parallel capacitive compensation on wave processes in the traction network; (5) Experimental definition of protective action of outlet transformers; (6) Increase in operational economy of the hydrocoupling of diesel drive; (7) Influence of temperature and pressure of external air on operating parameters of diesels; (8) Theoretical evaluation of changes in pressure fluid discharge and transitional processes in hydrocoupling; (9) High temperature thermomechanical processing of alloyed mercuric steel; (10) Choice of methods of preparation of component surface in fatigued state during their metallization by means of spray-coating, and (11) Constructive durability of alloyed mercuric steel following ordinary and isothermal tempering, thyristors. At determined stages of the regulation the [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 489, 1973, 80 pp, 44 Fig., 4 Tab., 52 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130050

#### IMPROVEMENT OF THE OPERATION OF THE CATENARY NETWORK AND PANTOGRAPH [Sovershenstvovanie ekspluatatsii kontaknoi seti i tokos'ema]

This pamphlet contains the following thirteen reports: (1) Ways of increasing labor production during work on the catenary network; observes irregularity of work load of workers of catenary divisions over the course of a year and the possibility of equalization; (2) Choice of a rational system of servicing catenary arrangements; scrutinizes the distribution of labor expenditures on operational servicing of the catenary by work types, and shows ways of shortening unproductive expenditure; (3) Test for operation of a double equal-elasticity catenary suspension; gives results of operational research on AC sections, and recommends schemata of this suspension for various lengths; (4) Several means for depression of auto-oscillations of catenary conductors; (5) Method for comparing the effectiveness of various mechanical means for decreasing auto-oscillations of catenary suspensions; (6) Influence of spring strings on the form of slackening of the carrying line of chain spring suspension; (7) Increase in reliability of the spark-gap; shows reasons for the exit from the system of spark-gaps; (8) Polymeric insulating elements of electrified railroad catenary network; puts forth technical requirements for the electrical characteristics of these insulators and the test results of dummy models; (9) Insulators from polymeric materials for sectional disconnecting switches of AC catenary network; (10) Experimental research on the interaction of the catenary conductor and the carrying line of the chain suspension during its various operating regimens; (11) The definition of the allowable heat temperature of metallo-ceramic catenary plates of current collectors; (12) Indications for catenary conductors of chain suspensions; (13) The application of hydraulic shock absorbers on electric rolling stock current collectors. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 496, 1973, 80 pp, 32 Fig., 11 Tab., 63 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130051

#### NEW DEVELOPMENTS IN ROLLING STOCK AND POWER SUPPLY TECHNOLOGY [Novoe v tekhnike podvizhnogo sostava i elektrosnabzheniia]

This pamphlet contains seventeen reports, which are enumerated below: automatic regulation of thermal conditions of transformers on semiconduc-

tor valves; wave processes in traction circuits, accounting for influence of the "two conductor-rail" system; parallel operation of AC traction substations of electrified railroads; research into rail potentials of AC traction networks; statistical voltage transformer for reserve feeding of the "Seima-3" protection system. No-contact measuring transformers in automatic control systems for recording wear and tear of rolling stock wheels; required frequency characteristics of DC traction substation smoothing mechanisms; reliability of apparatus of remote control electrical supply systems; experimental definition of slipping paths of locomotive wheel pairs; experimental research into dependence of transferable hydrocoupling moment on output pressure; calculation of body deformation of spray force pumps of type D100, D49, and IID45 diesels as the result of installation stress; investigation into protection of traction motors in transitional conditions on electric locomotives with electrical coupling of axles; increase in protection effectiveness of high voltage circuits from heating of passenger trains; investigation into possibilities for metallization by means of spray-coating as a method for the restoration of axle journals of wagon wheel pairs with roller axle boxes; influence of structural parameters on the tenacity of rail steel; hardenability of steel for highly stable rails; stability of results during the testing of stabilized steels for wear and tear. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 509, 1974, 138 pp, 53 Fig., 14 Tab., 64 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130052

**ELECTRONICS IN SYSTEMS OF AUTOMATION, TELEMECHANICS AND PROTECTION OF ELECTRIC TRACTION DEVICES** [Elektronika v sistemakh avtomatiki, telemekhaniki i zashchity elektrotrigovykh ustroystv]

This booklet presents twenty five reports, which are enumerated below: adoption of remote control systems on electrified railroads and their reliability; some problems in the definition of development perspectives of remote control systems on electrified railroads; reliability of transistors in operating conditions of EST-62 apparatus; basis for prophylactic conditions of remote control arrangements; remote control apparatus with disconnecting switches in the catenary network and automatic blocking lines; operational experiment of the electronic complex: "Miass 1"; research into interference caused by commutative processes in power apparatus; freedom from interference of thyristors in output elements of automatic control, and protection apparatus of the traction substations; photoelectric semiconductor mechanisms for elements of automatic and remote control systems; application of optical electronic elements in automation, protection, control, and transmission of information systems; measuring transformers in the apparatus of DC traction substations; stabilization of feeding conditions of automatic and remote control electronic arrangements; silicon rectifying unit reverse protection series; protection of 6-10 kV. high voltage lines of the automatic blocking system during glaze fusion; investigation of methods for the definition of fusion production on signaling, centralizing, and blocking devices; design characteristics of automated apparatus of electrical traction arrangements on the basis of microelectronics; active filters with double T-formation bridge; problems in the technology of hybrid thick-film microplans; influence of vibration on units and modules of the "Seima" system under low temperature conditions; freedom from interference of signal collectors utilized during remote control of auxiliary locomotives in amalgamated trains; investigation of a system of orthogonal distribution of signals for the transmission of dual information; application of the Rademaher-Walsh orthogonal signal system for remote control arrangements of long-composition trains; automation systems for control of electrical rolling stock; control of electrical heating in electrical trains; finally, mechanisms utilizing microelectronic elements for defining the effectiveness of train brake action. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 518, 1974, 161 pp, 82 Fig., 7 Tab., 49 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130053

**TRACTION POWER SUPPLY EFFICIENCY INCREASE** [Povyshenie effektivnosti tiagovogo elektrosnabzheniia]

A list of chapters covered in this pamphlet covers the following: (1) Increasing the effectiveness of 3 kV. direct current electrified railroads; (2) Algorithm for calculating traction during a given travel time along a direct current section, accounting for changing tension on the electric locomotive current acceptors under tractive and recuperative conditions; (3) Mathematical model for electrical energy loss calculation in a tractive electrical supply system; (4) Electrical energy loss in transformer assemblies; (5) Improved construction rectifier with natural air cooling on Townsend avalanche diodes, and its loading capacity; (6) Characteristics of inverted rectifier assemblies on thyristors; (7) Research on diode heating conditions during natural cooling and short-lived overloads; (8) Research overloading under rectifying conditions; (10) Overloading rectifiers; (9) New protection schemata for transformer overloading under rectifying conditions. (10) Overloading arising during opening of electromagnetic mechanisms with ferromagnetic cores; (11) Mathematical modeling of processes during graduated regulation of tractive substation alternating current tension; (12) Experimental research on tension spectrum of transverse electrical supply lines; (13) Influence of resistor-condenser contour parameters upon tension distortion of tractive substations with semiconductor transformers; (14) Electrical work safety in non-junction road laying on alternating current sections. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 520, 1974, 144 pp, 60 Fig., 14 Tab., 44 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130055

**LIFE INCREASE OF CONTACT WIRE** [Uvelichenie sroka sluzhby kontaktnogo provoda]

This volume presents information about gliding contact processes, as well as materials for contact conductors and plates (i.e. of inserts) of current pantographs. Study methods and analytical data of wear and tear of contact conductors under various operational conditions are mentioned; experimental utilization of new forms of contact conductors and replaceable inserts is described. Technical economic problems regarding contact conductor wear and tear are surveyed; research results into lowering wear and tear intensity of the contact conductor and choice of best current replaceable materials are summarized, as are basic directions of further work in this field. Catenary network specialists have been attempting to lengthen the service period of catenary conductance for years. Despite successes, the problem remains due to the steady growth of the electrified railroad networks, increases in motive parameters, weight, train speed, and locomotive power. The book is intended for technical engineering workers concerned with the contact network; it may also be useful to specialists in the field of electrical rolling stock, as well as to students of the higher educational institutions and technical schools in corresponding specialized fields. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Kuptsov, Iu E

Transport Publishing House 1972, 160 pp, 52 Fig., 28 Tab., 35 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

### 13 130056

**REFERENCE BOOK FOR THE OPERATION OF TRACTION SUBSTATIONS AND SECTIONING POINTS** [Spravochnik po ekspluatatsii tiagovykh podstantsii i postov sektionirovaniia]

This reference book presents the basic information regarding equipment, apparatus, and schemata for the traction substations and railroad sectioning posts on direct and alternating electric current. Basic attention is paid to new equipment, apparatus, and schemata which have been adopted over the past several years (e.g. semiconductor rectifiers, new forms of contact breakers, electronic automation, remote control, and protection arrangements, etc.). The reference book reviews basic contemporary operating procedures for

traction substations and section-posts, and provides recommendations for the discovery and elimination of faults in the equipment. The book is intended for technical engineering workers concerned with the operation of traction substation and sectioning posts. Chapter sections include; diagrams of energy supply systems, calculation of short circuit currents, high voltage alternating current equipment, high voltage direct current equipment, power cables, conductors, busbars, and insulators; safety technology, protective arrangements; automated and remote control systems; control, signaling, and measurement; actual needs, transitional arrangements. Some of the detailed information includes areas such as: resistors, condensers, commutational low-voltage devices, diesel electrical stations, light sources, automatic blocking devices, valves, overloads, temporary reactive power compensation mechanisms; etc. The book is all the more useful inasmuch as railroad electrification is rapidly increasing in the Soviet Union, and complete assemblies of control, automation, and remote control arrangements have recently been constructed. [Russian]

Abstract only is available in English; original untranslated as of November 1976.

Davydova, IK Popov, BI Erlikh, VM  
Transport Publishing House 1974, 416 pp, 115 Fig., 260 Tab., 22 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

### 13 130058

#### THE CATENARY NETWORK [Kontaktnaia set]

This book presents the fundamental components, assemblies, and constructions of the catenary network on electric railroads; methods for mechanical calculation of the catenary suspension brackets, and information for the calculation of the supporting and fixed constructions, bearings, and catenary foundation are given. The book also describes the interactions of the catenary suspension brackets and the current collectors during various train travelling speeds; it sets forth the fundamental processes of layout, construction, and operation of the catenary network. Great attention is paid to the insuring of operational reliability of the catenary network under all meteorological conditions and during high train travelling speeds, as well as to the raising of current output quality and the lowering of wear and tear of the catenary conductors. The catenary network must insure steady current output during highest speeds and under all meteorological conditions, and the recent raising of electric railroad speeds to 200-250 km/h led to a series of problems in the rolling stock. Both national and where necessary, foreign examples are used in the discussion of these difficulties. Chapters cover conductors, cables, isolators, armature, suspension terminals, freely handing conductors and simple simple suspensions, chain suspension, wind resistance, sectioning, grounding, protective safety devices and arrangements, catenary planning, and safety technology. present volume is maintained by the main administration of the Ministry of Railroads educational institutions in the capacity of a textbook for rail transport technical schools in the specialization: "Railroad transport energy supply and economics" and may prove useful to engineers and technicians occupied with the planning, construction, and operation of electrical railroad catenary networks. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Goroshkov, Iu I Bondarev, NA  
Transport Publishing House 1973, 384 pp, 216 Fig., 37 Tab., 26 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

### 13 130059

#### INSTALLATION OF ALTERNATING CURRENT CATENARY NETWORK EXPERIENCE OF THE ENGINEERING AND INSTALLATION TRAIN [Montazh kontaktnoi seti peremennogo toka. Opyt kollektiva, stroitel'na montozhnoy poezda]

This book presents the makeup and general work organization for assembly of the alternating current catenary network. (1) "Basic means and apparatus" discusses parameters and norms, quality control of bearings, transport of materials and equipment on railroad runs and stations, work production methods, preparation of catenary network for operation. (2) "Supporting arrangement assembly" presents mounting of cantilevers,

corbels for 25 kV. specified track conductor feeders, reverse current, stiff and flexible cross bars, splicing, combined methods, cross braces and carrier anchorings. (4) "Regulation of chain suspensions on railroad runs" includes mounting central anchorings, mounting locks with regulation of zigzags, catenary conductor height, and electrical joints. (5) "Assembly and regulation of catenary networks at stations" covers aerial switches, fixed spans, simple suspension, unrolling, anchoring, and interlinking without setting carrying cable on bearings, replacing chain suspension of outgoing sidings on extensions and sorting routes. (6) "Installation of sectioning apparat includes feeding and sectioning layout, mounting aerial intervals and sectioning isolators and disconnecting switches, remote control cables and coupling. (7) "Grounding bearings of catenary network and lightning protection" covers mounting individual groundings of bearings, group groundings, and tubular dischargers. (8) "Assembly of 25 kV. transmission line conductors, feeding conductors, and reverse current conductors includes assembly of complete transformer substations, feeding, outlet and reverse current conductors, and intermediate conductors across railroad paths. (9) "Assembly of catenary suspensions in synthetic constructions" includes bridges, tunnels, viaducts, and signal bridges. (10) "AC and DC catenary network junctions" covers distribution grouping points and feeding traction lines. Finally, (11) "Preparation for construction and components for catenary network in mechanical workshops" discusses cross brace production and making up a set of locks. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Koptev, A  
Transport Publishing House No. 259, 1965, 148 pp, 83 Fig., 33 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

### 13 130206

#### RESEARCH INTO POWER SUPPLY DEVICES AND RAILROAD ROLLING STOCK [Issledovanie ustroystv elektrosnabzhenia i podvzhnogo sostava zheleznykh dorog]

This publication presents the following reports: (1) Calculation of the higher harmonic currents from electric locomotives developed on power supply networks; formulas are given for evaluations under various conditions along with the parameters for each such state. (2) Calculation of the capacity of compensating installations and formulas for linear condensers taking into account possible overloading. Also given is distribution of condensers across the substation phases and in the power supply network. (c) Analysis of voltage interference on an AC substation with additional thyristor autotransformers; presented are the results of theoretical research on bus bars during regulation of the rectified current when controlled by supplementary transformer thyristors. It is determined that at a specific level of regulation the interfering current grows by 20-23 percent, which can be eliminated by utilizing the reaction of the autotransformer in one of the filter control links. (4) Influence of parallel capacitance compensation upon wave form in the tractive network. (5) Experimental determination of protective action of "suction" transformers with reverse feed from dangerous and interfering action produced upon communication lines by inductive effects of the traction network. (6) Increasing economy of operation of hydraulic transmissions on diesel engines. (7) Influence of temperature and pressure of inlet air on supercharged diesel locomotives. (8) Theoretical evaluation of varying consumption of transmission fluid on diesel hydraulic locomotives and evaluation of fluid flow changes as locomotive speed changes. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 489, 1973, 80 pp, 44 Fig., 4 Tab., 52 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 13 130237

#### ELECTRIC SUPPLY OF ELECTRIFIED RAILROADS [Elektrosnabzhenie elektrifitsirovannykh zheleznykh dorog]

This book presents theoretical principles of the operation of direct and alternating tractive electric supply systems, their interaction with electrical rolling stock and systems of external electrical supply. It also covers



methods of electrical computation; choice of parameters and design of electrical traction supply systems; the protection of electrical traction arrangements from short circuit currents; and the isolation of subterranean constructions and communication systems from the effect of tractive currents. In contrast to the previous issues, and relative to a change in the educational program; the present book excludes the investigation of problem of the protection of electrical tension systems from excess voltage and adds the topic of the protection of conductance communication system from tractive currents. This book has been ratified by the Main Administration of Educational Institutions of the Ministry of Railroads in the capacity of a textbook for the railroad transport technical schools in the specialties of energy supply and energy management of railroad transport and can also be utilized by workers of planning organizations and energy supply sections of roads for the solution of practical problems. The chapters are: (1) Brief information on energy systems; (2) Electrical networks; (3) General problems in the electrical supply of electrified railroads; (4) Electrical calculation of electrical traction supply systems; (5) Protection of electrical traction systems from short circuit and overload currents; (6) The compensation of reactive power, the regulation of tension and the lowering of the non-symmetry of currents and tensions; (7) Technical-economic calculations of electrical supply systems; (8) Planning energy supply systems; (9) Stray currents and the protection of subterranean constructions from electrical corrosions; (10) The influence of electrical current on conductance communication currents and protection from it; (11) Radio interference created by electrical traction systems and the lowering and suppression of these interferences. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Voronin, AV  
Transport Publishing House 1971, 296 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

**13 130242**  
**ANALYSIS OF OPERATION AND INCREASE IN RELIABILITY OF ENERGY SUPPLY SYSTEMS OF ELECTRIFIED RAILROADS** [Analiz raboty i povyshenie nadezhnosti ustroystv energosnabzheniia elektrifitsirovannykh zheleznykh dorog]

On the basis of many years of experience, this book puts forth an analysis of the operation of traction substations and of the catenary network of electrified railroads, and gives recommendations for increasing their reliability. The book is intended for technical engineering workers connected with the operation and design of electrified railroad energy supply systems, and can also be useful for instructors and students of the higher educational institutions and auditors of the qualification-increasing schools. The chapters include: (1) Fundamental conditions for the reliability of electrified railroad energy supply systems; (2) Damage to the catenary suspension; (3) Installations for the automatic control of the current collector characteristics; (4) Damage of the catenary network induced by corrosion; (5) Protection of the catenary network from short circuit current on direct current stations; (6) Protection from short circuit currents on alternating current sections; (7) Damage at the direct current tractive substations; (8) Damage at alternating current tractive substations. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Serdinov, SM  
Transport Publishing House 1975, 368 pp, 263 Fig., 39 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

**13 130243**  
**THE IMPROVEMENT OF SYSTEMS OF ROLLING STOCK AND THE ELECTRICAL SUPPLY OF RAILROADS** [Sovershenstvovanie ustroystv podvizhnogo sostava i elektroosnabzheniia zheleznykh dorog]  
This pamphlet presents the following reports: (1) Research into the designs of thyristor static transformers for the purposes of electrical supply of passenger railway cars; (2) Research into the interference stability of a remote control system utilizing orthogonal Walsh functions in the capacity of a mathematical model of channel signals; (3) The application field of

damping systems on tractive substations and methods for their calculation; (4) The interfering influence of conductance electrical supply on the network of aerial lines of communication; (5) Evaluation of the exactitude of synchronization of systems utilized in the capacity of a mathematical model of orthogonal Walsh function signals; (6) Research into heat characteristics of electrical traction rail connectors; (7) The dependence of the interference currents in communication networks on entry resistance of electrical rolling stock; (8) The influence of traffic regimen of electrical rolling stock on the passage allowing capability according to the power of electrical supply systems; (9) Research into oscillations of an asynchronous phase splitter of the ER9P electrical train; (10) Systems of automatic protection of diesel locomotives from overloads during operation; (11) Experimental investigations into the tension-deformed condition of cylindrical cases of the D100 diesel locomotives; (12) Research into a system of regulation of the rotational frequency of the diesel axle during operation with hydromechanical transmission; finally, (13) Methods of testing railroad rail on alternating curvatures.

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst Proceeding No. 476, 1975, 120 pp, 62 Fig., 12 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

**13 130245**  
**THE INTERACTION OF THE CURRENT COLLECTOR AND THE CATENARY AT HIGH SPEEDS OF TRAFFIC** [Vzaimodeistvie tokopriemnika i kontaktnoi seti pri vysokikh skorostiakh dvizheniia]

This covers the following topics: Means of measurement; The registration of movements in the upper hinge of the rolling frame of the current collector in relation to the foundation, the registration of vertical movements of the runner of the current collector in relation to the upper hinge of the movable chassis, the registration of the height of the runner above the foundation of the current collector, the registration of displacements of the catenary lead relative to the middle of the runner, the registration of vertical accelerations of the runner, the registration of the current of the contact of the runner-lead (of the catenary depression), the registration of the destruction of the contact between the separate plates of the runner and the catenary lead, the registration of the aerodynamical lift forces of the current collector, the registration of vertical movements of the vehicle in relation to parts without springs; the registration of fulcrums, the registration of vertical movements of the catenary lead in span, the railcar laboratory for the research of the interaction of the current collector and the catenary network, the general measuring circuit of the railcar laboratory and the constructional fulfillment of the railcar laboratory. Includes supplementary figures. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Belyayev, IA  
Transport Publishing House 1968, 160 pp, 92 Fig., 16 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

**13 130246**  
**THE INTERACTION OF THE CURRENT COLLECTOR AND THE CATENARY AT HIGH SPEEDS OF TRAFFIC** [Vzaimodeistvie tokopriemnika i kontaktnoi seti pri vysokikh skorostiakh dvizheniia]

This book lays out the results of research into several problems of the interaction between the current collector and the catenary network at high traffic speeds. The construction fulfillment of the catenary suspension and current collectors intended for high-speed traffic is described, and practical recommendations for their operation are given. National and foreign experience are reflected. The book is intended for engineering workers connected with the design and operation of the catenary network and the rolling stock of electrified railroads. The chapters are: (1) Current Removal from the Aerial Catenary Network; (2) Dynamic Parameter of the Catenary Suspension and the Current Collector; (3) Experimental Research into the Interaction of the Current Collector and the Catenary Network at High Speeds; (4) The Construction and Parameters of the Catenary Suspension Intended for High Speeds; finally (5) Current Collectors of High-Speed Electric Rolling Stock. [Russian]



Abstract only is available in English, original untranslated as of November 1976.

Belyayev, IA  
Transport Publishing House 1968, 160 pp, 92 Fig., 16 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow B-174, USSR

**13 130286**  
**PROSPECTS FOR THE APPLICATION OF SYNTHETIC LIQUID DIELECTRICS IN TRANSFORMERS [y primeneniia sinteticheskikh zhidkikh dielektrikov v transformatorakh]**

There exists a need for liquid dielectrics capable of operating in conditions under which the requirements for insulating liquids cannot be fully satisfied by petroleum derived oils. This applies to electro-physical parameters, the incombustibility of antiacid stability, and the temperature range of operational capability, which has special significance in the case of utilization of liquids in transformers installed on fire-and explosion-hazardous objects, aircraft, water and underwater vessels, etc. The study examined the properties of various types of synthetic oils (liquids) which appear promising as regards application in transformer construction. These types are oils based on synthetic hydrocarbons and oils based on chlorinated hydrocarbons. The figures and charts include the basic indicators of synthetic hydrocarbon oils, the influence of the structure of alkylbenzyl transformer oils upon their oxidation rate in the electrical field at 95 degrees C., and physical heat characteristics and relative prices of various types of synthetic liquid transformer oils. [Russian]

From the Reference Scientific-Technical Collection of Informelectro, the series High Tension Apparatus. Corporate author and availability information not provided. Abstract only is available in English, original untranslated as of November 1976.

Shakhnovich, MI Danilova, AI 1975, pp 42-46, 2 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

**13 130288**  
**PRINCIPLES FOR THE SELECTION AND COMPUTATION OF THE PROPERTIES OF SYNTHETIC NONCOMBUSTIBLE LIQUIDS FOR TRANSFORMERS [Printsipy podbora i rascheta svoistv sinteticheskikh negoriuchikh zhidkostei dlia transformatorov]**

This report discusses experimental dependencies of properties of transformer liquid mixtures which have a different chemical nature than the ratio of the components. It shows the possibility for analytical calculation of the properties of the mixtures of such components, and describes series of incombustible liquids with prescribed properties proposed on the basis of calculation methodology; these are: (a) low-congealing, (b) with improved heat transmitting properties, and (c) with lowered surface tension. The report concludes with the determination that mixtures of the examined transformer liquids which have differing natures are systems with chemically non-interacting components. This provides a theoretical basis for calculation of the basic properties of all mixtures of such liquids with the aid of simple equations. [Russian]

- Abstract only is available in English, original untranslated as of November 1976.

Shakhnovich, AN Kaliakina, AN Ageeva, NF *Elektrotehnika* No. 5, No Date, pp 49-52, 5 Fig., 3 Tab., 5 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Elektrotehnika Zoologicheskaya ul. 11, Moscow D-242, USSR

**13 130289**  
**CERTAIN PROPERTIES OF AN ELECTRICALLY INSULATED COMPOSITION OF SYNTHETIC LIQUIDS [Nekotorye svoistva elektrozoliatsonnoi kompozitsii sinteticheskikh zhidkostei]**

Described in this article is a new type of liquid dielectric based on hexachlorbutadene and chlorinated biphenyl, and possessing a low solidification temperature, good dielectrical properties, and high chemical stability. The indicated properties determine the possibility of utilizing new liquids in the capacity of dielectric for power transformers. The article concludes that (1) a composition consisting of 70-80% hexachlorbutadene and 20-30% chlorinated biphenyl is a new type of incombustible synthetic liquid for

transformers and, unlike similar types of presently utilized liquids, is a compound of low polarity, and (2) The composition is characterized by a low solidification temperature, good electrical properties, and high chemical stability. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Shakhnovich, MI Kogan, LM Kaliakina, AN Shuvaeva, GP *Elektrotehnika* No. 1, 1972, pp 61-62, 4 Fig., 2 Tab., 5 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Elektrotehnika Zoologicheskaya ul. 11, Moscow D-242, USSR

**13 130290**  
**AMPLIFICATION OF THE CATENARY NETWORK DURING PASSAGE OF UNIT TRAINS [Usilenie kontaktnoi seti pri propuske ob edinennykh poezdov]**

The traffic of unit trains on electrified sections is limited above all by the heating up of the leads of the catenary suspension. The temperature of heating is defined as the sum of the temperatures of the aerial environment and the overheating of the lead caused by currents of the charge. The most difficult conditions for heating up of the leads arise with the conjunction of the maximal temperature of the surrounding environment and the minimal speed of the wind. On the basis of an analysis of the maximal temperature of the aerial environment and the minimal wind speed for a ten year period for the Trans-Siberian main line from Novosibirsk-Chelyabinsk-Moscow there was obtained an estimated air temperature in the summer period of 35 degrees C. at minimal wind speed 1 m./s. Dependences obtained on the basis of calculations of heat characteristics allow the choosing of optimal distances between the electrical junctions according to the criterion of the best utilization of the profile of all leads of the chain suspension. The choice of the indicated distance is carried out in coordination with the current of the hourly operating mode of the electrical trains being handled on that section. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Portselan, AA Palei, DA Gornova, EO Sokolova, UA *Electrification and Energy Systems* No. 2(88), 1975, pp 1-21, 7 Fig., 6 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Ts.N.I.I.T.E.I. USSR Ministry of Railways, Moscow, USSR

**13 130291**  
**POWER SUPPLY COMPUTATIONS OF ELECTRIC RAILROADS [Raschety elektroznabzheniia elektricheskikh zheleznykh dorog]**

On an electrical railroad electrical supply system loads are continually changed as the result of changes of the modes of the trains, the track profile, the train weights, and their distribution on the supply section. The utilization of regenerative braking causes the appearance of negative loads in the traction network and in some cases in the substations as well. As the result of this the resulting loads on the feeder zone and, to a lesser degree, on the substations, are unequal. The greatest inequality of load is observed on suburban sections, caused by partial starting up and by short periods of energy usage by the trains. The article goes on to discuss the feeding regimen and voltage in the traction power supply, the influence of changes in voltage on the operation of the electrical rolling stock on single phase current roads, the influence of voltage on the throughput of the sections, the regulation of voltage, the longitudinal and transverse capacitance compensation, the traction networks, and their AC and Dc parameters: the calculation of instantaneous schemata, unidirectional feeding, junction feeding; methods of calculating electrical supply systems, calculation on the basis of the train traffic timetable, analysis methods; protection of the traction network from short circuit currents, and, finally, technical economic calculations of the electrical supply systems. [Russian]

Abstract only is available in English, original untranslated as of November 1976, from the book by M.N. Zvezdin, Power Supply of Electrified Railroads (Elektroznabzhenie elektrofitsirovannykh zheleznykh dorog.)

Zvezdin, MN  
Transport Publishing House 1974, pp 129-155, 15 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

13 130292

**FUNDAMENTAL PRINCIPLES FOR THE METHODOLOGY OF PRELIMINARY SELECTION OF VARIANTS FOR DETERMINING WITH THE USE OF ELECTRONIC COMPUTERS, THE OPTIMAL PARAMETERS OF POWER SUPPLY DEVICES [Osnovnye polozheniia metodiki predvaritel'nogo otbora variantov dlia vybora na E.Ts.V.M. optimal'nykh parametrov ustroistv elektrosnabzheniia]**

With the use of computers for planning energy supply arrangements the necessity arises to examine a large quantity of variants of the distribution of traction substations, the equipment installed in them, and a cross section of the leads of the catenary network. In order to accelerate and simplify the calculations it is expedient to choose fundamental parameters according to a statistical methodology based on the analysis of operational data, and then variants which ensure a minimum of expenditures by a mathematical modelling method; these are verified as to reliability and insurance of a given capacity in normal and forced regimens of operation. The basic principles of the statistical methodology consist of the following: (1) according to output data (cargo flows, types of electric locomotives, train weight) to define the line midyear load (in square tons-hour per km.) of all trains; (2) according to nomograms define the optimal distances in the area of economical cross sections, and taking into account the tying of the substations to the distant points, and the types of suspensions, set the variants; and (3) to calculate the mid-24-hour expenditure of energy for each substation. This is used as output to define the calculated loads and choose parameters for the electrical energy system. In this way, by using statistical methodology, it is possible to carry out a preparatory selection of those variants which yield a minimum of expenditures, and then to complete on the electronic computer verification calculations with the concentration of trains, as well as to consider the throughput according to energy supply arrangements when switching off one or several in series of the traction substations. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Miroshnichenko, RI

All-Union Labor Red Banner Railway Research Inst Proceeding No. 476, No Date, pp 51-60, 4 Fig., 3 Tab., 5 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

13 130293

**THE DETERMINATION OF THE TRANSFORMING CAPACITY OF TRACTION SUBSTATIONS [Opredelenie transformatornoi moshchnosti tiagovykh podstanstii]**

The transformer capacity of traction substations can be correctly defined only by examining the traction load as a random function of time and taking into consideration characteristics of flow of train traffic in a period of long interruption in operations stipulated by the fulfillment of track repair work during the time of the "window" and following it. In addition it must be calculated in a manner such that the intensity relative to the wear and tear of the winding insulation during the calculation period composes 0.9. With a view to ensuring the accidental overloads the output value relative to the wear and tear is taken to be equal to 0.9 and not 1. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Ter-Oganov, EV

All-Union Correspondence Inst Railroad Engineers Proceeding No. 74, 1975, pp 24-37, 2 Fig., 7 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: All-Union Correspondence Inst Railroad Engineers Moscow, USSR

13 130294

**DETERMINATION OF THE NECESSARY TRANSFORMING CAPACITY GIVEN A RANDOM CHARACTER OF THE LOAD CURVE [Opredelenie neobkhodimoi transformatornoi moshchnosti pri sluchainom kharaktere grafika nagruzki]**

The power of transformers supplying whatever load will be determined correctly if the relative wear and tear of the insulation of the winding for the entire economically feasible service period of the transformers turns out to

be equal to a unit. In order to calculate the transformational power, graphs of the load capability can be utilized. In addition to this it is necessary to have a stable round-the-clock graph of the load transformed into an equivalent rectangular load. However in a number of branches of the national economy, random operating regimens of consumers are encountered. The task for solving transformational power when examining the load as a random process leads to finding a mathematical expectation for the intensity relative to the wear and tear of the winding insulation. This can most accurately be accomplished by the probability modeling of the load schedule. The mathematical expectation of the intensity relative to the wear and tear can more simply and with sufficient accuracy be found on the basis of statistical characteristics of the temperature of the winding. The article concludes that the essential difference in the values of the permanent times of the winding and the oil, and the correlation times of the load, permit the proposition of sufficiently simple formulas for the definition of statistical temperature characteristics of the winding, which can in turn be utilized for finding the relative wear and tear of the insulation and calculating the necessary transformational power. The formulas obtained on the basis of the theories of random fixed functions are not connected to the type of correlational functions and the law of load distribution. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Markvardt, GG Ter-Oganov, EV *Elektrichestvo* No. 6, 1973, pp 46-49, 16 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: ESL

13 130295

**DETERMINATION OF THE PARAMETERS OF SAFETY DEVICES PERMITTING THE PANTOGRAPH STRIP TO DEVIATE RESILIENTLY DURING INCURSION ONTO AN OBSTRUCTION [Opredelenie parametrov predokhranitel'nykh ustroistv, pozvoliaiuushchikh polozu tokopriemnika uprugo otkloniat'sia pri naezde na prepiatstvie (Trudy O.m.I.I.T.a. 137)]**

The aim of ensuring reliable current collection, the prevention of possible damage of the current collector and the catenary network, led to the appearance of a series of protective devices built into various assemblies of the current collectors in such a manner that upon encountering an obstacle arising on the catenary network, the blow would be mollified and the runner, deflected downward, would elude the dangerous object. The requirements for recovering devices can be formulated as follows: (1) the mass of the parts of the current collector which are deflected upon interaction with impediment must be minimal; (2) the size of the recovering horizontal force must be independent of the height of the rise of the current collector and the height of the dip of the carriage; (3) The horizontal deflection of the runner must not exceed the allowable significance (following which it becomes impossible to re-turn the runner to an original position due to the appearance of a significant moment from the static depression of the current collector); (4) At the time of the blow it is desirable to have motion of the runner not only backward, but also downward (without lowering the frame of the current collector). The study concludes that (1) in order to calculate the parameters of the preventive devices which allow the runner to firmly deflect upon encountering an impediment, it is possible to utilize the methods proposed in the article and (2), the analysis carried out upon lower deflecting devices in the upper junctions and the deflections of the beam frames of the current collectors attests to the significant influence of the angle of deflection (or the height) of the runner upon the reversal of the moment and the force. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Mikheev, VP

Omsk Scientific Research Institute (Om.I.I.Ta.) Proceeding No. 137, No Date, pp 57-63, 3 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Omsk Scientific Research Institute (Om.I.I.Ta.) Omsk, USSR

13 130296

**DETERMINATION OF THE SUPPLEMENTAL VERTICAL DISPLACEMENT OF THE PANTOGRAPH RESULTING FROM THE CURVATURE OF THE STRIP AND THE POSITION OF THE CONDUCTOR IN THE PLANE [Opređenje dopolnitel'nogo vertikal'nogo peremeshchenia tokopriemnika za schet krivizny poloza i raspolozhenia provoda v plane]**

Pantograph shoes with positive curvature (middle portion raised above end points where the horn begins) are applied in practice. It is interesting to clarify the influence of this characteristic of the construction upon the current removal in the established mode of operations. The presence of positive curvature leads to the degradation of conditions of dynamic interaction of the current collector with the catenary suspension due to the appearance of supplementary vertical movements of the runner leading to the increase of the vertical accelerations at the same train speed. It was shown earlier that in order to improve the current removal it is necessary to have negative curvature (directed downwards). With this it is possible to attain a position at which the mass of the runner will not have acceleration in motion along a lead installed with positive sag. The article goes on to discuss the raise of the runner at various distances of the lead from the angle of the track, the dependence of the raise of the runner upon the height of the rise of the current collector at any point of the span of a simple suspension with zigzag, the rise of the runner at any point of the span of a chorded suspension, and the total vertical movement of the runner due to the positive curvature and the changes of the height of the suspension. The report concludes that (1) the supplementary movements of the runner due to the presence of positive curvature depend upon a series of factors and can be defined according to the proposed formulas for various types of catenary suspensions. (2) The supplementary motion of the runner increases with the increase of the distance from the axis of the track and the decrease of the radius of curvature. (3) The supplementary motion of the runner is different at various points of the span, during which for the simple suspension with zigzag on sections the best motion is obtained under a fulcrum and for chorded suspension—in the middle of the span. (4) The received analytical expressions for defining the height of the current collector rise due to curvature can be easily introduced into methods for calculating on the computer the interaction of the current collector with the suspension, and this allows connection of the radius of curvature with the trajectory and the catenary depression of the current collector. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Mikheev, VP

Omsk Scientific Research Institute (Om.I.I.Ta.) Proceeding No. 137, No Date, pp 64-73, 6 Fig., 2 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Omsk Scientific Research Institute (Om.I.I.Ta.) Omsk, USSR

13 130297

**EFFECT OF THE FORCE OF VISCOUS FRICTION ON OSCILLATIONS OF THE SYSTEM OF SLIDING FRAMES OF PANTOGRAPHS [Vliianie sily viazkogo trenia na kolebaniia sistemy podviznykh ram tokopriemnikov (Trudy O.m.I.I.T.a. 137)]**

Improvement of current collection at high speeds can be attained by the introduction of damping in the various assemblies of the current collector mechanism. In order to correctly select the optimal parameters of the damping element, it is necessary to analyze the influence of the presence of viscous (or dry) friction in the system upon the oscillation process. An equality describes the free oscillations of a load supported on springs; this defines vertical oscillations of an absolutely firm load on an absolutely weightless spring. In real conditions the movement of material means occurs in an environment with resistance: (1) dry (or coulomb) friction; (2) viscous (or linear resistance) proportional to the first degree of speed; (3) vortical (or square), proportional to the square of the speed. The report concludes that (1) the application of damping oscillations of the frames of the current collectors causes an increase in the period of free oscillations, which depends upon the size of their mass and the firmness of the measuring spring (train traffic speed). (2) During the analysis of results of experiments or calculations, interactions of the current collector equipped with damping and the catenary lead, it is necessary to take into consideration the influence of the size of the resistance coefficient of the damper upon the free oscillation period of the current collector. [Russian]

Abstract only is available in English, original untranslated as of

November 1976.

Mikheev, VP Zharkov, VT Drobotenko, AF  
Omsk Scientific Research Institute (Om.I.I.Ta.) Proceeding No. 137, No Date, pp 74-78, 2 Fig., 2 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Omsk Scientific Research Institute (Om.I.I.Ta.) Omsk, USSR

13 130298

**THE AUTOMATIC DIAGNOSIS OF THE PRESSURE CHARACTERISTICS OF THE PANTOGRAPH DURING OPERATION [Avtomaticheskaiia diagnostika kharakteristiki nazhatiia tokopriemnika v protsesse ekspluatatsii]**

Requirements for increasing operational reliability of pantographs continually grow in relation to increased speeds and operational conditions. Prevention of current collector failures can be attained by using automatic devices for diagnostical tests directly on tracks and at stations. One of the chief characteristics of the current collector is its static depression. The analysis of existing methods and mechanisms for verification of the static depression characteristics permitted composition of a generalized structural schema for automatic registration of the current collector depression (ARNT) and formulation of the basic technical requirements for its production. This article presents a description of devices for registration of the current collector depression; characteristics are examined and its operational peculiarities are analyzed. The fundamental goal of utilizing the proposed mechanism is increased reliability of the current collector due to control and registration of its static characteristics in its entire operational range. The mechanism must avoid damage to the catenary network and current collectors, lower the wear and tear of the catenary leads, and the collector's plates. Completion of economic calculations revealed the expediency of working out this device. The mechanism allows automatic measuring of the static depression in the entire operational of range heights without a stop of the electric locomotive. The operation revealed its capability and the simplicity of servicing, and finally, with the complete operation of the ARNT-4 mechanism ensures reliable operation with established accuracy. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Mikheev, VP

Omsk Scientific Research Institute (Om.I.I.Ta.) Proceeding No. 137, No Date, pp 79-86, 3 Fig., 7 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Omsk Scientific Research Institute (Om.I.I.Ta.) Omsk, USSR

13 130299

**DETERMINATION OF THE PARAMETERS OF PANTOGRAPHS WITH SELF-REGULATING DEVICES, GUARANTEEING THEIR STABLE OPERATION IN TRANSITIONAL REGIMES [Opređenje parametrov tokopriemnikov s avtoreguliruiushchimi ustroistvami, obespechivaiushenhikh ikh ustoiichivuiu rabotu v perekhodnykh rezhimakh]**

Ensuring current collection on electrified railroads is usually tied to the optimization of parameters for current collectors and catenary suspensions in order to stabilize the catenary depression. Presently there is a substantial increase in train traffic speeds and the power of electric rolling stock. Catenary suspensions with definite parameters can be created for the imminent electrification of railroads to operate in new conditions. Modernization of the catenary network of existing electrified railroads aiming to ensure this can provoke serious difficulties. The most economical way of solving this problem for new conditions on lines which were electrified 10-20 years ago is to apply improved current collectors not requiring capital reconstruction of the existing catenary network. Such are current collectors with self-regulating mechanisms or follow-up systems with reverse communication, differentiated by regulated or regulating parameters and the installation of self-regulating mechanisms in various assemblies. When designing these it is also necessary to choose and verify values of a series of supplementary constructional parameters of the interacting system: "current collector-suspension", so that conditions giving rise to auto-oscillations will not be created. This article addresses the task of examining these phenomena by the example of type TS-1M current collector with rolling foundation, and proposes criteria for evaluating self-regulating devices to be used on planning

and testing units and line tests. It is necessary to work out the structural schema of the system, compose calculation equalities, and carry out their analysis for concrete data characteristics. The article concludes that for the system: "current collector with self regulation--catenary suspension system" a verification for stability in transitory conditions is obligatory. The criteria defining the system's stability are overcontrol, time regulation, and the oscillation indicator. The methods stated above allow calculation of the current collector parameters which ensure its stable operation in the transitory operating modes. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Mikheev, VP Zharkov, VT Belyayev, IA *Vestnik Ts.N.I.I.* 1972, pp 11-15, 5 Fig., 6 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: All-Union Labor Red Banner Railway Research Inst USSR Ministry of Railways, Moscow, USSR

### 13 130300

#### THE TECHNICAL ECONOMIC EFFECTIVENESS OF THE APPLICATION OF SECTIONAL INSULATORS WITH POLYMERIC INSULATING ELEMENTS

[Tekhniko-ekonomicheskaya effektivnost primeneniia sektionnykh izolyatorov s polimernymi izoliruyushchimi elementami (Trudy Ts.N.I.I. 521)]

At present there are widely applied on the catenary network of the U.S.S.R. multi-dimensional sectional insulators with polymer insulating elements. Thus on direct current sections SI-2 insulators with AG-4C plexiglass inserts are widely utilized. Alternating current sectional insulators TsNII-2 with polymer insulating elements, which are simultaneously slide blocks coming into contact with the rolling stock current collector runner, are also widely utilized. Analysis revealed that the economical effect from the application of direct current type SI-2u new sectional insulators can be summarized in the following factors: the difference in the price of the traditional insulator and the new one; the difference in the stability of installation into the catenary suspension; the difference in the service periods; and the increase in the reliability of the operation of new insulators in comparison with old ones. The economical effect in a given instance is manifested both in the production sphere and the utilization sphere on the roads as well. These factors are all carefully calculated mathematically in the article. The total economic effect is a saving of 760 rubles per 100 km. of track. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Genkin, SM Morozova, TV

All-Union Labor Red Banner Railway Research Inst Proceeding No. 521, 1974, pp 98-104, 2 Fig., 2 Tab., 3 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: All-Union Labor Red Banner Railway Research Inst USSR Ministry of Railways, Moscow, USSR

### 13 130301

#### THE USE OF POLYMERIC MATERIALS IN DEVICES OF THE CATENARY NETWORK [Primenenie polimernykh materialov v ustroystvakh kontaktnoi seti]

The development of the chemical industry promoted the polymer material as the most promising substitute for traditional insulating and bearing materials of the catenary network of electrical railroads. Possessing specific electrical, mechanical, and chemical properties, polymer materials receive wide application where the utilization of other materials is generally impossible or ineffective. The application of polymer materials in many cases allows finding completely new simple ways for solving complex technical tasks connected with the increase of train traffic speeds and their introduction on railroads of electric current on single phase current of industrial frequency of 25 and 50 kV tension. The main application areas of polymer materials during the construction and operation of the catenary network are catenary suspensions, anchoring the catenary suspensions and leads, catenary suspensions in artificial constructions, sectional insulators, neutral inserts of the catenary suspensions, insulation of construction of anchored sections of catenary suspensions, cantilevered catenary suspensions and solitary leads, catches, flexible cross beams, catenary network dividers, catenary suspension simulators, etc. This report elaborates upon (1) general information on the application of polymer materials; (2) polymer

insulators of insertion of devices; (3) constructional fulfillment of polymer rod insulators, devices and assemblies of the catenary network with elements from polymer material; (4) sectioning insulators with polymer insulator inserts. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Goroshkov, Iu I *Zheleznye Dorogi Mira* No. 1, 1976, pp 3-23, 21 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Zheleznye Dorogi Mira Moscow, USSR

### 13 130302

#### THE UNIVERSAL HIGH-SPEED SECTIONAL INSULATOR TS.N.I.I.7MA FOR THE CATENARY NETWORK OF ELECTRIC RAILROADS [Universal'nyi vysokoskorostnoi sektionnyi izolyator Ts.N.I.I.7MA dlia kontaktnoi seti elektricheskikh zheleznykh dorog]

National and foreign experience on the elaboration and operation of sectional insulators for the catenary network of electrified railroads reveals that the most rational and reliable sectional insulators are those with polymer rod insulator inserts operating practically only upon the tension (with very small eccentricity of application of the tension from the pull of the catenary lead) and are not slide blocks of the sectional insulator. The TsNII7MA sectional insulator was developed with such insulating inserts: it is high-speed and universalized (unified) and can be applied on direct (3-6 kV) as well as alternating (15-25 kV) current, and also at junction stations. It is intended for installation in catenary suspensions with one as well as two catenary leads; and it ensures normal passage of the current collectors at speeds up to 160 km/hour (tested at speeds up to 180 km/hour). Its length is 2.9 m, its mass--31 kg. The essential advantage of this insulator over more perfected insulators presently used in the USSR and abroad is the presence of three pairs of long arc arresting horns which ensure its safe operation in emergency modes (during passage of the current collector along the insulator, when one of the sections of the catenary network is switched off or grounded), as well as with a significant variety of potentials in the sectionalized sections of the catenary network of both alternating and direct current. The sectional insulator TsNII7MA is a USSR invention; it has been patented in France and Iran. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Goroshkov, Iu I *Vestnik Ts.N.I.I.* No. 2, 1975, pp 13-15, 1 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: All-Union Labor Red Banner Railway Research Inst USSR Ministry of Railways, Moscow, USSR

### 13 130308

#### COMPARATIVE FUNDAMENTALS OF ELECTRIC AND DIESEL TRACTION [Osnovnye polozheniia sravneniia elektricheskoi i dizel'noi tiagi]

This report consists entirely of fifteen fundamental points of comparison of electric and diesel traction. Inasmuch as steam traction is significantly behind electric and diesel according to technical economic indices and its fraction in train operations is below 1%, the economic basis of railroad electrification consists in the comparison of electric and diesel. The choice of traction is a task which determines the increase of throughput capacity, train speed, and technical economic indices. The comparison is based on calculation, analysis, and comparison of the basic operational and economic indices of each type of power. There are also natural indicators which determine the choice: the locale of the line and the track network, the need for energy resources, locomotives and railcars, passenger service conditions, train speeds, and the conditions of development of energy systems and regional electric supply. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways No Date, 6 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmannaya 2, Moscow B-174, USSR

13 130309

**ELECTRIFICATION OF USSR RAILWAYS IN THE 1964-1974 PERIOD [Elektrifikatsiia zheleznykh dorog SSSR za period 1964-1974 gg]**

This is a summary of information pertaining to electrification of railroads in the U.S.S.R. during 1964 to 1974 period. The report covers utilization of various types of current, the change of the fuel energy balance in railroad transport, characteristics of the load, the net cost of transport and work production, comparative characteristics of locomotives, the operational reliability of energy feeding devices, the remote control of energy supply apparatus, the improvement of throughput of earlier electrified railroad sections, and the further improvement of electrical supply systems. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Serdinov, SM

USSR Ministry of Railways 1974, 10 pp, 9 Fig., 7 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

13 133292

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. TRACK AND CONTACT RAIL**

The project was designed to develop a revised and updated series of handbooks covering various aspects of the design, construction, and equipment of a modern rail rapid transit system. This volume deals with track and contact rail.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PCS70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-7, Mar. 1975, 58 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-251648/2ST, DOTL NTIS

13 133294

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. POWER**

The Power Standards for new lines provide the basic concepts for the design of traction power systems for new routes. The Standards describe the criteria used for the determination of the power requirements, the parameters used in the selection of substation sites and the types of electrical equipment employed for the conversion of High Tension AC power to DC traction power. They include the techniques used to control the power system from one control point and the means by which each substation can be controlled in the event of a supervisory cable failure. The Standards also describe the methods employed to give maximum safety in the substations and on the railroad in case of faults or emergencies. These guides should prove helpful in the design of traction power systems for new routes.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PCS70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-9, Mar. 1975, 31 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-251650/8ST, DOTL NTIS

13 139465

**DEVELOPMENT OF SINGLE-PHASE SUBSTATIONS AND SWITCHING POINTS [Evolution des sous-stations et postes de voie monophasés]**

A review of earlier developments in single-phase electric traction systems, and requirements in respect to disturbances caused by current at industrial frequency, to justify research in progress: increasing the power factor, protection against over-voltage, parallel connection of sub-stations, and ferro-resonance phenomena. The article ends with a description of research

on the equipment planned for the electric supply on the new Paris-Lyons line. [French]

Laurenceau, JN *Revue Generale des Chemins de Fer* No. 3, Mar. 1976, pp 177-185, 5 Fig., 2 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

13 139476

**CALCULATION OF THE TRACTION VOLTAGE DROP IN DOUBLE-TRACK ELECTRIC RAILWAYS WITH ANY NUMBER OF TRANSVERSE COUPLING POINTS [Berechnung der Spannungsabfalle zweigleisiger elektrischer Bahnen bei beliebiger Anzahl von Querkuppstellen]**

No Abstract. [German]

Schmidt, P *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 22 No. 2, 1975, pp 401-417, 3 Tab., 6 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List Friedrich List Platz 1, Dresden 801, East Germany

13 139480

**POSSIBLE MEASURING TECHNIQUES IN THE DB FOR OPERATING TRIALS ON CATENARY SYSTEMS FOR 250 KM/H [Messtechnische Moglichkeiten der DB zur Erprobung von Fahrleitungssystemen fuer 250 km/h]**

The authors describe the catenary systems and their behavior when pantographs pass along them at high speed. The measuring methods described for appraisal of the systems, and the results obtained, enable the constructor to take suitable measures to prevent premature wear of the catenaries and the pantograph contact bars. [German]

Bethge, W Seifert, R *Eisenbahntechnische Rundschau* Vol. 25 No. 3, Mar. 1976, pp 162-171, 4 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

13 139485

**TESTING A 6 KV D.C. ELECTRIC TRAIN [Ispytaniya elektropoezda postojannogo toka 6 kV]**

One of the means of improving the technico-economic efficiency of d.c. electric traction is to increase voltage in the catenary to 6 kV, and use thyristor converters with impulse regulation of the output voltage in the rolling stock. At the test loop of the Research Institute of the USSR Ministry of Communications, tests on energy and traction were carried out with an ER2V electric train designed for 6 and 3 kV voltage in the catenary, and with impulse frequency regulation. [Russian]

Stiben, GA Tretjak, TP *Zheleznodorozhnyi Transport* No. 4, 1976, pp 48-51

ACKNOWLEDGMENT: UIC

ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmanaya ul. 4, Moscow B-174, USSR

13 139498

**COMPARISON OF THE REACTIONS ON THE ELECTRIC SUPPLY SYSTEM OF ELECTRIC MOTIVE UNITS WITH AMPLITUDE CONTROL, CHOPPER CONTROL, TWO-SECTOR ASYMMETRICAL CONTROL, AND THREE-PHASE A.C.-D.C. CONVERTERS [Vergleich der Netzrueckwirkungen elektrischer Triebfahrzeuge mit Amplitudensteuerung, Anschnittsteuerung, Sektorsteuerung und Vierquadrantensteller]**

No Abstract. [German]

Schaefer, H *Elektrische Bahnen* Vol. 46 No. 12, Dec. 1975, pp 299-303, 1 Fig., 2 Tab., 6 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

13 139936

**A SELECTED BIBLIOGRAPHY OF RAILROAD ELECTRIFICATION**

This bibliography contains references to technical and economic articles in journals worldwide and to technical papers on all phases of railway mainline and rapid transit electrification. Selections cover the period 1929 to 1973 with listings under individual years.

Prepared under Contract and Technical Directive for Transportation System Center, DOT.

Kusko (Alexander) Incorporated May 1974

Contract DOT-TSC-203

ACKNOWLEDGMENT: TSC

ORDER FROM: Kusko (Alexander) Incorporated 161 Highland Avenue, Needham Heights, Massachusetts, 02194

DOTL RP

13 139952

**BR SUBURBAN SCHEME USING 25KV AND 750V**

Headspan and portal installations on the Kings Cross suburban electrification achieve economic overhead line equipment while conversion of former LT tube line to Moorgate retains the third rail to accommodate existing tunnel-bore construction.

*Railway Engineer* Vol. 1 N Mar. 1976, pp 27-31

ACKNOWLEDGMENT: British Railways

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

13 141105

**MANUFACTURE OF COMPOSITE ALUMINUM-STEEL CONTACT RAILS WITH METALLURGICAL BONDING BETWEEN ALUMINUM AND STEEL BY COEXTRUSION**

[Herstellung von Aluminium/Stahlverbundstromschielen mit metallurgischer Bindung Zwischen Aluminium und Stahl durch Verbundstrangpressen]

The process of manufacturing steel-clad aluminum rails by coextrusion is described. Investigations of the properties of an AlMgSi 0.5 rail clad with 18-9 stainless steel include the strength of the bond, the bimetal effect, the effects of fatigue stresses, stretching and bending on the bond, corrosion of the rail, the abrasion resistance of the steel cladding, and weldability of the rail. The electric resistivity of the interface is about 1 micro-ohm/sq cm. [German]

Theler, JJ (Aluminium Rolling-mills, Germany); Wagner, A *Metall* Vol. 30 No. 3, Mar. 1976, pp 223-227

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

13 141462

**IMPROVEMENT OF THE DAMPING PROPERTIES OF CATENARIES** [Provsyenie demfirujuschih svojstv kontaknyh podvesok]

The article examines various means of improving the damping properties of catenaries, and shows the advantage of incorporating friction vibration-dampers in the catenary suspensions over line sections where high speeds are practised. [Russian]

An, VA Belyayev, IA *Vestnik Vniizt* No. 3, 1976, pp 1-4, 1 Fig., 1 Tab., 2 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Vestnik Vniizt 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

13 141578

**RAILROAD ELECTRIFICATION IN THE UNITED STATES**

The history of railroad electrification falls into three phases that might be designated the primitive, the pioneer and the mature. The first was the period of preliminary experiments covering the mid-Nineteenth Century. The second, concentrated in the decade of 1895-1905, was marked by the first successful installations in Europe and the United States. The third, the age of technological maturity, grew directly out of the previous period. The

piecemeal electrification in the U.S., the author concludes, reflected the absence of a national transportation policy and parallel absence of a national railroad system. He urges that the energy efficiency of electrified railroads receive national attention in transportation planning.

Condit, CW (Northwestern University, Evanston) *Institute of Electrical and Electronics Engrs Proc* Vol. 64 No. 9, Sept. 1976, pp 1350-60, 15 Fig., 47 Ref.

ORDER FROM: ESL

DOTL JC

13 142253

**STUDY OF PANTOGRAPH WEDGING IN CROSSOVER TRACK**

In crossovers in electrified territory, there is the possibility that the edge of the pantograph horn may wedge itself between the converging contact wires, causing major damage. A digital computer program has been developed to simulate this pantograph wedging. Its results are compared with full-scale test results. The problem of several vehicles with pantographs in a single train is also considered.

Manabe, K Nakama, F

Railway Technical Research Institute Quart Rpt. Vol. 17 No. 1, 1976, pp 39-40, 7 Fig.

ACKNOWLEDGMENT: Railway Technical Research Institute

ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

13 142259

**A CALCULATING METHOD OF TEMPERATURE RISE IN A SELF-COOLED OIL-IMMERSED TRANSFORMER FOR ELECTRIC TRACTION LOADING**

Generally, temperature rise in a self-cooled oil-immersed transformer is treated as proportional to 0.8 power of its loss. But there are some problems in application of this treatment to thermal calculation of the transformer for electric traction loading which fluctuates violently. Many thermo-couples were inserted in a test transformer for measurement of its thermal characteristics, and a calculating method of the temperature rise in the transformer is studied under several operating conditions.

Yamazaki, S

Railway Technical Research Institute Quart Rpt. Vol. 17 No. 2, 1976, pp 60-63, 7 Fig., 4 Ref.

ACKNOWLEDGMENT: Railway Technical Research Institute

ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

13 142299

**DEVICE FOR MEASURING THE STRENGTH OF CONTACT BETWEEN THE CATENARY AND THE PANTOGRAPH**

[Einrichtung zur Messung der Kontaktkraft zwischen Fahrdrabt und Stromabnehmer]

The author describes a measuring device that works using steel wire extensometers and optical transmission of signals. He also explains the first measurement results. [German]

Kluzowski, B *Elektrische Bahnen* Vol. 47 No. 5, May 1976, pp 112-114, 1 Fig., 2 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

13 142303

**POLLUTION OF 25 KV ELECTRIC TRACTION INSULATORS. CONSEQUENCES AND REMEDIES** [La pollution des isolateurs en traction electrique 25 kV. Consequences et remedes]

No Abstract. [French]

Urbain, JP Margarit, R *Revue Generale des Chemins de Fer* Vol. 95 June 1976, pp 361-373, 12 Fig., 5 Tab., 2 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

13 142307

**PRESENT STATE OF OPERATING TRIALS WITH QUENCHABLE UNSYMMETRICAL BRIDGE CIRCUITS [Stand der Betriebserprobung der loeschbaren unsymmetrischen Brueckenschaltung (LUB)]**

Use of quenchable unsymmetrical bridge circuits improves the power factor of converters appreciably in relation to the conventional type of phase-angle control. Automatic switching of the converters is made possible by a quenchable circuit mounted in parallel to the main thyristors. [German]

Dreimann, K Falk, P *Elektrische Bahnen* Vol. 47 No. 6, June 1976, pp 132-136, 8 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

13 142590

**NEW SINGLE ARM PANTOGRAPHS**

The SBS 65/25 pantograph has been developed for operation at speeds up to 250 km/h. Article presents the technical details. [German]

Publisher unknown. Address inquiries to the Documentation Bureau, DB.

*Die Lokomotivtechnik* Feb. 1972, pp 19-20

ACKNOWLEDGMENT: FRA  
ORDER FROM: German Federal Railway Documentation Bureau, 8 Munich, West Germany

13 142606

**CURRENT COLLECTION AT REGULAR AND HIGH SPEEDS AS WELL AS AT THE PASSAGE OF A LARGE NUMBER OF TRAINS**

Soviet Railways evaluate the effectiveness of current collection by the sparking, heating of the pantograph shoe inserts and, primarily, the wear of the contact wire and shoe inserts. Analysis of the causes of wear for any type of traffic is followed by special problems resulting from high speeds, DC and AC systems, insert materials, high current demand, heavy traffic and passage of multiple pantographs. Metallurgy of the contact wire is also discussed, along with catenary details for lines with frequent, heavy trains. Translated in draft form.

All-Union Labor Red Banner Railway Research Inst No Date, 6 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

13 142931

**AIR POLLUTION IMPACT OF RAILROAD ELECTRIFICATION**

The potential air pollutant emission reductions and energy savings were evaluated for freight and passenger traffic diversion from existing modes to electrified railroad in the Houston-Dallas intercity corridor. Energy savings of 5%-10% could be realized by conversion from diesel to electric railroad operation. Energy savings of 55% could occur by conversion from automobiles to electric railroads, and up to 75% by conversion from diesel trucks to electric railroads for equivalent freight and passenger movements. Domestic coal and uranium could be used as energy sources. Conversion to electrified railroad would reduce overall emissions by 86% as compared to diesel trucks for freight, and up to 96.5% as compared to automobiles for passengers. Reductions of over 90% could occur in hydrocarbon and carbon monoxide emissions, and over 50% for nitrogen oxides emissions. High efficiency sulfur oxides controls were necessary when burning coal to reduce its emissions to levels equivalent to other modes.

Cooper, HBH, Jr (Texas University, Austin); Richards, HA (Texas A&M University); Lam, ATB (Washington University, Seattle) *ASCE Journal of the Environmental Engineering Div* Proceeding Vol. 120 No. EE4, Paper 12312, Aug. 1976, pp 723-736

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

13 142932

**METHOD FOR CALCULATING THE INFLUENCE OF HIGH VOLTAGE CABLES ON TELECOMMUNICATIONS LINES**

[Methode de calcul de l'influence des cables a haute tension sur les lignes de teletransmissions]

No Abstract. [French]

Aguet, M Cavalli, U *Association Suisse des Electriciens Bulletin* Vol. 67 No. 16, 1976, pp846-8531, Fig., 3 Tab., 21 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Association Suisse des Electriciens Stauffacherquai 36-40, 8004 Zurich, Switzerland

13 145131

**CURRENT YIELD IN REGULAR AND HIGH RATES AS WELL AS AT THE PASSAGE OF A LARGE NUMBER OF TRAINS**

[Tokosem pri obychiykh i v'sokikh skorostiakh dvizheniia, a takzhe pri bol'shikh massakh poezdov]

USSR Railways evaluates the effectiveness of current collection by the sparking, the heating of the pantograph inserts, and mainly the rapidity of the wear of the contact wire and the pantograph inserts. At any speed the wear of the contact wire and current collector inserts may be of the following types: Molecular-mechanical; abrasion; contactless electric arc erosion; electric explosion contact erosion. Some methods of overcoming the wear may be counterproductive for either the wire or collector. At high speeds electric arc erosion is the primary type of wear. Various other wear and current collection problems are discussed. One of these is the provision of adequate supply for locomotives drawing high currents. [Russian]

Complete translation available.

USSR Ministry of Railways No Date, 6 pp

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6A, Moscow B-174, USSR

13 147701

**NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROJECT. TASK 16: ELECTRIFICATION SYSTEMS AND STANDARDS**

This report studies catenary systems for the 150 mile/h train service proposed for the Northeast Corridor with electrification at 25 kV 60 Hz. Following a review of high speed catenaries, a computer simulation is used to show that current collection by multiple unit trains fitted with existing pantographs, running under existing catenaries between Washington and New Haven, will be satisfactory only at temperatures typically within the range 40 degrees F to 90 degrees F. Some deterioration will occur outside this range. Recommendations include minor modifications to catenaries between Washington and New York, and between Stamford and New Haven; major changes to the catenary between New York and Stamford, and development of pantograph with improved dynamic performance. An autotensioned compound catenary with 210 foot spans is proposed for new 150 mile/h electrification between New Haven and Boston. The levels of interference with trackside communication and signal circuits have been computed, showing that existing mitigation measures are inadequate. Possible improvements are discussed and further study is recommended. The power demand of proposed traffic is analyzed and recommendations made for the power supply network. Finally, estimated costs of associated engineering and construction work for catenary and power supply are provided.

Research was sponsored by DOT, FRA, Northeast Corridor Project Office.

Pehrson, VW Shaw, PL Suddards, AD Willetts, TA  
Electrack Incorporated Final Rpt. FRA/NECPO-76/19, Dec. 1976, 387 pp, Figs., Tabs., 10 App.

Contract DOT-FR-40032

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

13 147833

**CURRENT COLLECTION AT HIGH SPEED**

After reviewing overhead line developments with the raising of speeds, the author discusses performances of present day catenaries and how they meet



requirements. He then considers other current collection possibilities-without-contact methods, by capacity, magnetic induction, electromagnetic waves, laser ray, and electric arc.

Morales, GP *Revista A.I.T.* No. 11, Aug. 1976, pp 53-65

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Revista A.I.T.

13 147893

**ELECTRIC ARC POWER COLLECTION FOR HIGH-SPEED TRAINS**

One of the many problems in high-speed ground transportation is supplying the necessary power to the vehicle, as on-board power generation is not attractive due to the rapid increase in the power requirement with speed. Power collection with a sliding pantograph becomes increasingly difficult as train speed increases. Alternative methods of contactless power collection are critically reviewed in this paper. It is concluded that power collection along the line using an electric arc appears to have the best advantages. A study of the literature has shown that arcs can be driven magnetically at speeds higher than 500 km/h without being extinguished, and that electrode wear at high arc speed is relatively low. The known problems of arc initiation and reignition at high speeds are not insurmountable in the light of present day experience and techniques in this area. The results of an experimental investigation of power collection by an electric arc which is being carried out at the University of Sheffield are also included. The electrode geometry plays a significant role in the arc maintenance, and interelectrode gap changes from 1 to 10 cm can be tolerated without reduction in arc lifetimes under certain conditions. Experimental results on electrode wear which is affected

by arc current level, arc speed, and the electrode material, are presented. These show that the damage to the overhead wire is at an acceptably small level.

Klapas, D Hackam, R (Sheffield University, England); Benson, FA (Sheffield University, England) *Institute of Electrical and Electronics Engrs Proc* Vol. 64 No. 12, Dec. 1976, 16 pp, 23 Fig., 68 Ref.

ACKNOWLEDGMENT: Institute of Electrical and Electronics Engrs Proc  
ORDER FROM: ESL

DOTL JC

13 148249

**COMPUTER APPLICATION IN RAILROAD ELECTRIFICATION**

Computer programming is a useful tool in the design of high-voltage, ac, electrified railroads. The paper describes a few of the more important computer programs that have been developed for use in the study and design of electrified railroad systems, interrelationships among these programs in the design process; and the input requirements and typical output of each program.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976. See also RRIS 04 148248.

Gandhi, MR (International Engineering Company)  
American Society of Mechanical Engineers Conf Paper Paper GP-2, 1976, 8 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

15 133105

**GUIDELINES FOR THE IDENTIFICATION AND MEASUREMENT OF SOCIAL FACTORS IN TRANSPORTATION PLANNING**

The purpose of the study is to establish guidelines and procedures for the measurement of the social effects of transportation systems and facilities on both a regional and community or neighborhood level. This coincides with the increased emphasis on human factors in the planning and design of transportation systems and facilities which has necessitated the development of a systematic approach to gathering social data and developing normative standards. In part this increased emphasis has been mandated by Federal statutes such as the National Environmental Policy Act of 1969 and the Intergovernmental Act of 1968. A detailed examination of the seven-fold classification scheme of social factors and an emphasis on the methodologies used to evaluate social impacts is discussed. Emphasis is placed on the analytical framework utilizing the major phases of inventoring existing social conditions, identifying potential changes and measurement of probable impacts. From this analysis a systematic approach to identifying and measuring social impact in transportation planning is put forth, for use by those assigned this responsibility.

Washington State Department of Highways, Federal Highway Administration, (HR-527) Final Rpt. RPR-25.2, Sept. 1975, 29 pp

ACKNOWLEDGMENT: NTIS  
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PB-250991.7ST, DOTL NTIS

15 137363

**INTEGRATED ANALYSIS OF SMALL CITIES' INTERCITY TRANSPORTATION TO FACILITATE THE ACHIEVEMENT OF REGIONAL URBAN GOALS. INTERCITY TRANSPORTATION IN RURAL REGIONS: VOLUME I. INVENTORY AND ANALYSES**

Published in two volumes the research is a continuation of that presented in a report, June 1974 with the same title. The research focuses upon intercity transportation and its relationship to socioeconomic characteristics in rural regions. The study area consists of nine administrative planning regions in Iowa that do not include a community of 50,000 or more population. The objective was to relate the intercity transportation system of small urban communities to their ability to attract and absorb growth. This volume reports on an inventory of the transportation system in the study regions, including an update of data presented previously on bus and rail passenger movements and air transportation. The inventory includes water transportation and additional forms of public passenger transportation, motor truck and rail freight transport, and an investigation into expansion in the transportation role of agricultural cooperatives.

See also reported dated June 74, PB-236612 and Volume 2, PB-254931.

Ring, SL Millett, ML Carstens, RL Meeks, HD Thompson, WH  
Iowa State University, Ames, Department of Transportation Final Rpt.  
ISU-ERI-AMES-76090, ISU-ERI-AMES-76179, Dec. 1975, 176 pp

Contract DOT-OS-30106

ACKNOWLEDGMENT: NTIS  
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PB-254930/1ST, DOTL NTIS

15 137364

**INTEGRATED ANALYSIS OF SMALL CITIES' INTERCITY TRANSPORTATION TO FACILITATE THE ACHIEVEMENT OF REGIONAL URBAN GOALS. INTERCITY TRANSPORTATION IN RURAL REGIONS: VOLUME 2. REGIONAL FACTORS AND ANALYSES**

The volume includes analyses of the structure and development of economic planning regions as typified by the nine rural regions which constitute the study area for this research. Other research topics include studies of the feasibility of a demand-responsive air taxi system and air ambulance service. Mailed survey instruments were utilized to define patterns and characteristics of travel in rural regions and to afford information concerning behavior in response to shortages of transportation energy and attitudes toward such shortages. Recommendations are formulated to address typical transportation problems in rural regions and to enhance their potential for growth.

See also Volume 1, PB-254930.

Richards, RO Brewer, KA Prescott, JR Millett, ML Carstens, RL  
Iowa State University, Ames, Department of Transportation Final Rpt.  
ISU-ERI-AMES-76190, DOT/TST-76/43-Vol-2, May 1976, 379 pp

Contract DOT-OS-30106

ACKNOWLEDGMENT: NTIS  
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PB-254931/9ST, DOTL NTIS

15 141436

**COMPREHENSIVE AREAWIDE RAILROAD CONSOLIDATION AND RELOCATION STUDY--ST. LOUIS REGION. VOLUME 4-ECONOMIC FACTORS; ST. LOUIS REGION**

This report on "Economic Factors-St. Louis Region" for the Comprehensive Areawide Railroad Consolidation and Relocation Study contains an analysis of the key demographic and economic characteristics of the St. Louis region as well as the results of a preliminary investigation of riverfront redevelopment potential. Past trends in key indicators- population, households, income, employment, residential and nonresidential construction, and retail sales-are identified and analyzed. Projections of these characteristics are presented to the year 1995. The information to be derived from this work recognizes the fact that improvements to the railroad system within the St. Louis region and the potential for the development of released land will take place within the context of the economic resources and constraints operating within the region. The various demographic and economic factors add to and/or detract from the region's ability to take advantage of the benefits to be achieved through railroad-associated redevelopment. A summary of Riverfront economic conditions is presented along with a discussion of constraints upon redevelopment and preliminary findings on reuse opportunities.

See also V1 RRS 24 141433; V2, 20 141434; V3, 20 141435; V5, 25 141437; V6, 15 141438. Co-authors of this report are Parsons, Brinckerhoff, Grotz and Eric Hill, and Morton Hoffman and Company, Baltimore, Maryland.

East-West Gateway Coordinating Council Final Rpt. Vol. 4  
EWG-PB-0268.10.0, June 1974

Contract DOT-FR-20023

ACKNOWLEDGMENT: FRA  
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15 141438

**COMPREHENSIVE AREAWIDE RAILROAD CONSOLIDATION AND RELOCATION STUDY--ST. LOUIS REGION. VOLUME 6-LOCAL PLANNING**

This report on "Local Planning" for the Comprehensive Areawide Railroad Consolidation and Relocation study-St. Louis Region identifies the effects which the operation of the existing St. Louis Railroad Network has on the surrounding communities and neighborhoods, evaluates the reuse potentials of those lands which could be retired as a result of railroad relocation and/or consolidation, and presents concept plans for their redevelopment. Specific attention is devoted to the community of East St. Louis, Illinois and its Mississippi Riverfront lands.

See also V1 RRS 24 141433; V2, 20 141434; V3, 20 141435; V4, 15 141436; V5 25 141437. Co-authors of this report are Parsons, Brinckerhoff, Grotz and Eric Hill.

East-West Gateway Coordinating Council Vol. 6 EWG-PB-0268.10.0,  
June 1974

Contract DOT-FR-20023

ACKNOWLEDGMENT: FRA  
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15 141581

**RAILWAY RELOCATION IN CANADA**

Railways were instrumental in the development of many North American communities. The present place they now occupy in the centre of our cities no longer corresponds to their importance. Thus, historical, technological and socio-economic factors are exerting pressures for the removal of railways

in urban centres. A study of past railway relocation reveals certain patterns as well as cause-and-effect relationships which should be carefully examined when contemplating future railway relocation.

Research for this paper was funded by the Canadian Transport Commission.

Rotoff, BM  
Manitoba University, Canada Occasional Paper 5, Jan. 1975, 42 pp, 12 Fig., 19 Ref.

ACKNOWLEDGMENT: Manitoba University, Canada  
ORDER FROM: Manitoba University Canada Center for Transportation Studies, Winnipeg, Manitoba, Canada

**15 142928**  
**INTEGRATED EVALUATION FROM A REGIONAL PERSPECTIVE**

Congestion in the Washington area is examined and statistical data on population are reviewed to show the number of people and vehicles in the Washington area. Local governments of the Washington area have been among the leaders in the national trend toward the development of growth management programs. The fact that local governments, regional planning agencies, citizen organizations, and private enterprise groups have expressed support for the development of metropolitan growth policy is analyzed. The impact of the different growth patterns and policies are viewed along with the varied social indicators used in impact analysis.

Rodgers, J Wickstrom, GV *ASCE Journal of the Urban Plan and Develop Div* Proceeding Vol. 102 No. UP1, Paper 12338, Aug. 1976, pp 125-136

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

**15 144014**  
**THE IMPACTS OF BART ON PROPERTY VALUES-A CASE STUDY OF THE ROCKRIDGE NEIGHBORHOOD**

This report describes BART's impact on the sales price of single-family houses in the Rockridge neighborhood. The Rockridge area of Oakland and its recent history are described as the hypotheses to be tested, and the general research strategy. Four specifications of an econometric model are discussed, and the variables used in the regression equations are identified. The before-after, the cross-sectional and the cross-sectional-longitudinal approaches are evaluated. The four models were used to test the null hypothesis that changes in sales prices of comparable houses did not correlate with distance to the BART station.

Report on BART Impact Program.

Skaburskis, A  
Metropolitan Transportation Commission, Department of Transportation, Department of the Air Force Work Paper DOT-BIP-WP-10-@-76, Jan. 1976, 100 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-258367/2ST, DOTL NTIS

**15 145138**  
**THE IMPACTS ON COMMUNITIES OF ABANDONMENT OF RAILROAD SERVICE. FINAL REPORT**

This report seeks, county by county, to show the gross economic consequences of rail line abandonment as part of the Final System Plan development for Conrail as undertaken by the U.S. Railway Association. Specifically it seeks to measure displacement of workers and output, decline in local real income and income, payrolls and non-labor income generated communities. It also estimates the decline in revenues of local suppliers of directly affected firms. The study presents summations, industry by

industry, of the gross displacement of jobs and output and the gross reductions in income generated by directly affected plants. The impact of abandonments on use of energy and on the environment is also discussed. The appendix describes the mathematical model used, data acquisition and procedures, field studies and questionnaire used for deriving shipper and consignee information.

Buchanan, S Jones, NH, Jr Ferguson, AR Cole, BL Slavsky, BÊ Habib, V  
Public Interest Economics Center, (R009.2) Volumes 2 and 3, July 1975, 182 pp, Figs., Tabs., Apps.

Contract USRA-C-50010

ACKNOWLEDGMENT: United States Railways Association  
ORDER FROM: United States Railways Association 2100 2nd Street, SW, Washington, D.C., 20024

DOTL HE2757.B83

**15 147588**  
**ROADS AND TRANSPORTATION ASSOCIATION OF CANADA ANNUAL CONFERENCE PROCEEDINGS. CALGARY, 1975**

This paper focuses on the urban-ecological impacts of railway relocation in the affected neighborhoods and communities. The research consists primarily of an analysis of twenty-four case studies of railway relocation in Canadian urban centres and a survey of several cases of anticipated railway relocation projects. In order to better appreciate the problems involved, a look at the historical circumstances of railway development in Canada is done, as well as the legal and statutory aspects which have shaped the urban landscape.

Rotoff, BM (Manitoba University, Canada)  
Roads and Transportation Association of Canada Proceeding No. 6, Sept. 1975, pp 25-41, Apps.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

**15 147861**  
**LAND-USE RESOURCES AND TRANSPORT**

The space requirements of transport networks are reviewed and problems arising out of space shortage are analysed in road, rail, harbour and airport land use. Possible space saving options from within the transport system include: collective as opposed to individual transport; underground as opposed to surface collective transport; pedestrian zones as opposed to space for vehicles; and traditional as opposed to new technologies. Land use and transport planning should aim at reducing both the need to travel and the length of the journeys to be made. The number of the covering abstract of the symposium is IRRD no. 221684. /TRRL/

Presented at the Sixth International Symposium on Theory and Practice.

Hernando, J (Ministry of Public Works, Spain) *SIXTH INTERNATIONAL SYMPOSIUM ON THEORY AND PRACTICE* Conf Paper 92-821-1036-2, 1976, pp 243-343, 7 Fig., 3 Tab., Refs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-222853)  
ORDER FROM: OECD Publications Center 1750 Pennsylvania Avenue, NW, R1207, Washington, D.C., 20006

**15 148260**  
**TOWARD THE DEVELOPMENT OF AN ACCOMMODATION SERVICE POLICY**

Continued public support for ever-increasing operating deficits of transit service demands that uneconomic services be curtailed. Nevertheless, a certain amount of service may be justified in terms of community welfare as "accommodation" to particular user groups--those which are dependent upon public transportation for mobility. The paper suggests that transit agencies no longer need make this judgment intuitively. A rigorous set of

decision-making rules which test uneconomic routes or services for their efficacy in meeting community-welfare demands is presented. Under these rules, routes are successively evaluated against five criteria: operating ratio, effectiveness, intensity, captive riders and community welfare. A case study of the application of this algorithm to a medium-sized transit system is presented to illustrate the method.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Polin, L (Simpson and Curtin Incorporated); Mauro, GT  
American Society of Mechanical Engineers Conf Paper Paper P&P-2,  
1976, 5 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

16 093751

**ENERGY BALANCE FOR THE WASHINGTON METROPOLITAN AREA FOR 1973**

A framework of accounts used in the metropolitan energy balance is presented for each of the following headings: resource type, fuel type, method of conversion, energy use, and demand sector. A table by fuel type of non-renewable and renewable primary energy resources used in the metropolitan Washington area is presented. Energy use data are presented in three demand sectors: (1) commercial, industrial, and institutional, (2) residential, and (3) transportation. Energy use data are presented by fuel type and demand sector using the following accounts: space heat, water heat, air conditioning, process, ground passenger transportation, ground freight transportation and air transportation. A flow chart is presented showing how a metropolitan energy resources model is integrated into a metropolitan framework model used for forecasting the effects of alternative metropolitan management strategies over a specified planning period.

Graham, P Markle, T Krouse, V Haas, R  
Metropolitan Washington Council of Governments, Department of  
Housing and Urban Development Final Rpt. June 1975, 48 pp

Grant HUD-CPA-D.C.-1011

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS Repr. PC, Microfiche

PB-245391/8ST, DOTL NTIS

16 093927

**A SUMMARY OF OPPORTUNITIES TO CONSERVE TRANSPORTATION ENERGY**

This report surveys the near term opportunities for energy conservation in passenger and freight transportation. The present (1972) transportation energy flows and modal efficiencies are characterized. A total of 35 possible conservation measures are discussed and ranked for effectiveness. Their potential fuel savings are projected for 1980 and 1990.

Pollard, J Hiatt, D Rubin, D  
Transportation Systems Center Final Rpt. DOT-TSC-OST-75-22, Aug.  
1975, 110 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS Repr. PC, Microfiche

PB-247790/9ST, DOTL NTIS

16 094802

**ENERGY, ENVIRONMENT AND GROWTH PLANNING STUDY**

The report assesses the impact of increasingly more complex interactions between energy, environmental, and socio-economic factors on future state plans, policies and programs. It covers: (1) definition of general methods for establishing and conducting energy, environment, and growth (EEG) planning at the state government level; (2) analysis of FEA energy conservation programs with respect to scheduling, funding, objectives, and state government response; (3) analysis of existing state government organization relative to potential EEG functions; (4) a summary of the findings of task forces associated with the Second Arizona Symposium on Energy, Environment and Growth; and (5) definition of requirements and procedures for EEG planning analysis, including definition of an energy supply/demand model and preliminary forecasts of future energy requirements and economic/environmental impacts of various population growth scenarios.

Prepared in cooperation with Ultrasystems, Inc., Phoenix, Ariz. Dynamic Science Div.

Pinnacle Peak Road, Federal Energy Administration, Ultrasystems, Incorporated FEA/D-76/019, Feb. 1975, 325 pp

Contract FEA-CA-04-50001-00

ACKNOWLEDGMENT: NTIS

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PB-249354/2ST, DOTL NTIS

16 134004

**EVALUATION OF INTERACTION BETWEEN RURAL REGIONAL TRANSPORTATION AND ENERGY AVAILABILITY**

The energy crisis of 1973 can be considered an indicator of future problems. The impact on personal and goods mobility alone will have far-reaching

consequences, not only in the urban areas but also in the rural regions. In fact, because of the less dense population distribution, rural regions are more sensitive to changes in energy form, cost, and availability. Maintaining the desirability of U.S. rural regions as a place to live is important to the welfare not only of this country but also of other countries of the world who depend on U.S. food exports for their survival. The wholesale abandonment of unproductive railroad lines imposes limitations on the economic viability of bypassed small cities. It creates constraints in the options for electric power generation and distribution system development and will have a dramatic effect on the economics of grain terminal locations and grain transportation. Even the system for providing heat to isolated farm homes and small towns will be interrelated with transportation forms of the future. Transportation system decisions have far-reaching implications on individual life-styles and the welfare of the nation, and it behooves decision makers to consider these interrelationships.

Ring, SL Brewer, KA Butler, DL (Iowa State University, Ames)  
*Transportation Research Record* No. 561, 1976, pp 12-22, 7 Fig., 3 Tab., 3 Ref.

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DOTL JC

16 136415

**ELECTRICITY FOR TWENTIETH CENTURY TRANSPORTATION**

The use of electricity for transportation is considered in perspective as it applies to the remainder of the 20th century. It is argued that petroleum may not always be available in sufficient quantities at appropriate prices to sustain U.S. transportation needs in a manner that will support the desired socio-economic climate. Liquid synthetic fuels from non-petroleum resources may not be available in sufficient quantities to replace petroleum. A combination of solutions may be required, and is certainly desirable, to help alleviate all potential energy crises that are associated with the above. Electric power is applicable to automotive and railroad use, and can readily be made available assuming reasonable foresight as to needs. Two studies on the impacts of use of electric cars in the regions of Los Angeles, St. Louis and Philadelphia during the remainder of this century are discussed. Advantages of rail electrification and of all-electrification and of all-electric rail operations are pointed out. It is estimated that it would take five years to electrify 1000 track miles. Of the total 207,000 route miles of U.S. rail, about 22,000 have heavy enough traffic to justify electrification.

Presented at the 8th Annual Front of Power Technol Conf., Oklahoma State U., Stillwater, October 1-2, 1975

Ecklund, EE (Energy Research and Development Administration)  
Oklahoma State University Proc Paper No. 18, 1975, 31 pp, 23 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Oklahoma State University Stillwater, Oklahoma, 74074

16 137418

**FUTURE SCENARIOS FOR URBAN TRANSPORTATION**

The author finds that, between 1972 and 1990, urban passenger miles will greatly increase. This increased demand will be met by a particular modal split. Presently, these modes have certain characteristics. Unless the internal combustion auto meets the statutory emission standards, it will cause more air pollution harm than the diesel bus and electrified modes. Using total energy consumption comparisons, the internal combustion auto that meets DOT suggested fuel economy standards for 1980 (19.6 mpg) is twice as energy intensive as the diesel bus, three times as energy intensive as rapid rail and the electric bus, and five times as energy intensive as the electric car and the advanced GRT. If 47% of all urban travel is made on electrified modes in 1990, 1.6 billion barrels of petroleum can be saved, at a cost of 1.7% increase in anticipated electricity demand. The author concludes that to decrease energy consumption, improve urban air quality, and improve urban transportation, strategies should be aimed at achieving a transit and electric intensive modal split. Opportunities for action include (1) strongly supporting HR 8800, which, if passed, will appropriate \$160 million for 5 years to the Energy Research and Development Administration (ERDA) for Electric Vehicle R and D; (2) working in cooperation with ERDA to develop an urban private passenger electric vehicle and improved battery powered electric bus.

Leahy, MP

Urban Mass Transportation Administration Final Rpt. UMTA-RDD-9-75-1, Aug. 1975, 120 pp

Contract RDD-9

ACKNOWLEDGMENT: NTIS, UMTA  
ORDER FROM: NTIS

PB-255349/3ST, DOTL NTIS

#### 16 139503

##### ENERGY USE IN TRANSPORTATION

The United States' energy budget, efficiency, and electric transport are analyzed in tabular and graphical presentation.

A paper from "Energy and Hum Welfare--A Crit Anal; Sel of Pap on Soc, Technol, and Environ Probl of Electr Power Consumption."

Grimmer, DP Luszczynski, K  
MacMillan Information Vol. 3 1975, pp 29-43, 16 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: MacMillan Information 866 Third Avenue, New York, New York, 10022

#### 16 139504

##### ENERGY THRIFT IN URBAN TRANSPORTATION: OPTIONS FOR THE FUTURE

Various energy-reducing strategies are examined and presented in tabular and graphical form. Travel data, decentralization patterns, and weight-engine type-energy consumption relationships are considered in appendices.

Energy Conserv. Pap.

Fels, MF (Princeton University); Munson, MJ  
Ballinger Publishing Company 1975, pp 7-104, 71 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Ballinger Publishing Company 17 Dunster Street, Harvard Square, Cambridge, Massachusetts, 02138

#### 16 139506

##### ENERGY, EMPLOYMENT AND DOLLAR IMPACTS OF ALTERNATIVE TRANSPORTATION OPTIONS

Intercity transport modes considered are the railroad, the airplane, and the automobile. The bus and the automobile are the urban transport modes considered. Each travel mode is treated as an entire system of passenger transportation. The costs are evaluated in units of dollars. British thermal units (Btu) and man-years of labor, which are required, both directly and indirectly, to provide each unit of transportation service. Data are tabulated.

Energy Conserv Pap.

Hannon, B (Illinois University, Urbana); Herendeen, R Puleo, F Sebald, A

Ballinger Publishing Company 1975, pp 105-130, 19 Ref

ACKNOWLEDGMENT: EI

ORDER FROM: Ballinger Publishing Company 17 Dunster Street, Harvard Square, Cambridge, Massachusetts, 02138

#### 16 139508

##### ENERGY ALTERNATIVES FOR CALIFORNIA: PATHS TO THE FUTURE

This report presents the results of a Rand Study aimed at identifying and analyzing energy policy issues facing the State of California. The report is divided into four parts. The first provides an overview of the California energy system. The second part of the report addresses nine energy supply issues: West-East oil movement, offshore oil and gas development, a northern California deepwater port, liquefied natural gas, gas transportation from the North Slope of Alaska, natural gas regulation, natural gas allocation policies, electricity generation, and the development of alternative energy sources. The third part analyzes issues of energy use and conservation. In the final part, the implications of three different scenarios of California's energy future, each of which incorporates a different set of policy actions, are described and discussed.

Ahern, W Doctor, R Harris, W Lipson, A Morris, D Nehring, R DeHaven, J Graubard, M Jaquette, D Lee, A Mooz, W Salter, R Wolf, K  
Rand Corporation No. R-1793-CSA/RF, Dec. 1975, 332 pp, Refs.

ACKNOWLEDGMENT: EI

ORDER FROM: Rand Corporation 1700 Main Street, Santa Monica, California, 90401

#### 16 139517

##### FOSSIL FUEL RESOURCES

Domestic and world reserves are reviewed in tabular and graphical form.

Selection from Energy and Hum Welfare--A Crit Anal; Sel of Pap on Soc, Technol, and Environ Probl of Electr Power Consumption, Macmillan Inf, New York, N.Y. 1975.

Williams, R  
Macmillan Information Vol. 2 1975, pp 1-23, Tabs., 22 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Macmillan Information 866 Third Avenue, New York, New York, 10022

#### 16 139518

##### LONG-RUN MARGINAL COSTS OF ENERGY

This report is a compendium of information about costs and quantities of energy resources that may be available to the United States through the 1980 decade. The following key areas are covered: Future long-run costs for crude oil and natural gas; long-run costs for syncrude from shale oil; costs for tanker transport of crude; future refinery and product distribution costs; characteristics and long-run costs of pipeline transportation; the present and future costs of electric service; the costs of coal production; and nuclear fuel-cycle costs.

Anderson, KP DeHaven, J  
Rand Corporation Report R-1590-NSF, Feb. 1975, 273 pp, Refs.

ACKNOWLEDGMENT: EI

ORDER FROM: Rand Corporation 1700 Main Street, Santa Monica, California, 90401

#### 16 139519

##### FEDERAL ENERGY ADMINISTRATION PROJECT INDEPENDENCE REPORT

Project Independence was initiated in March of 1974 to evaluate the Nation's energy problems and provide a framework for developing a national energy policy. The Project's general design and various facets are summarized in this first of twenty-five volumes. The Executive Summary, also included here, points out that the report assesses the "base case" situation through 1985, if current policies prevail. It evaluates the impacts and implications of a wide range of major energy policy alternatives. Specific policy recommendations are not made. Rather than evaluate hundreds of alternative actions, the study contrasts the broad strategic options available to the United States: increasing domestic supply, conserving and managing energy demand, establishing standby emergency programs. The strategies are evaluated in terms of their impact on: development of alternative energy sources; vulnerability to import disruptions; economic growth, inflation and unemployment; environmental effects; and regional and social impacts.

Federal Energy Administration Nov. 1974, 880 pp, Figs., Tabs.

ACKNOWLEDGMENT: EI

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n.4118-00029

#### 16 139521

##### FEDERAL ENERGY ADMINISTRATION PROJECT INDEPENDENCE BLUEPRINT FINAL TASK FORCE REPORT: COAL

Estimates are provided of the potential production capabilities of the coal industry and the resources necessary to achieve these levels of production. Topics covered included: resources and reserves; recent trends in production, consumption and transportation; potential constraints on production; Federal coal leasing policy; environmental impacts; and recommendations of various actions to be undertaken by legislative bodies. Federal and State Governments the coal producing and consuming industries, and other areas of the economy pertaining to coal supply and demand.

Federal Energy Administration Nov. 1974, 1975 pp

## ACKNOWLEDGMENT: EI

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n.4118-00015

16 139522

**FEDERAL ENERGY ADMINISTRATION PROJECT  
INDEPENDENCE BLUEPRINT TASK FORCE REPORT: AN  
HISTORICAL PERSPECTIVE**

This report was developed to serve as the background for the studies carried out as part of Project Independence. The report traces the history of the various major energy sources, concentrating on the period from the end of World War II to the eve of the Arab oil embargo. The reserves, consumption, technology, economics and government policy toward oil, coal, natural gas, nuclear energy, electric power, and energy sources are examined. The first two sections of the report, Historical Perspective of World Energy, and U.S. Energy Perspective, deal with major trends and events influencing all energy sources. Special emphasis is given to the government policies which shaped the development of energy production and consumption.

Federal Energy Administration Nov. 1974, 47 pp

## ACKNOWLEDGMENT: EI

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n.4118-0026

16 141559

**INTERCITY FREIGHT FUEL UTILIZATION AT LOW PACKAGE  
DENSITIES -AIRPLANES, EXPRESS TRAINS AND TRUCKS**

Several aspects of modal energy analysis are examined including the impact of freight density on modal trip energy comparisons. Secondary energy consumptions such as apply to manufacturing and facilities operation are not considered. In Section II, modal market data define the field of interest--the transportation of low density commodities in airplanes, express trains and trucks. Modal energy utilization efficiencies are developed in Section III, which also includes a critique of some commonly used analysis methods. Mode comparisons, major findings and study limitations are presented in Section IV.

Mays, RA Miller, MP Schott, GJ (Boeing Company) *Transportation Journal* Vol. 16 No. 1, Sept. 1976, pp 52-75, 20 Fig., 4 Tab., 25 Ref.

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16 141560

**ENERGY AND FREIGHT MOVEMENTS**

Better understanding of the efficient use of energy in transportation is essential for maximum petroleum conservation while maintaining a high level of freight transportation service. Values such as empty travel as a percent of total travel and ton-mile per gallon can be completely misleading, although when properly interpreted can be useful. These and other points concerning truck data and performance measures can be explained with the four examples of intercity operation described and with two examples of urban operation. All examples are based on values near the limits of actual operation to illustrate possible ranges and relationships.

French, A (Department of Transportation) *Transportation Journal* Vol. 16 No. 1, Sept. 1976, pp 26-41, 7 Fig., Tabs.

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DOTL JC

16 141566

**RAPID TRANSIT ENERGY DEMAND**

This article describes the effect of rapid transit train performance on power and energy demands to put into perspective how important the cost of energy may be in determining the basic design and operation of any rapid transit system. High acceleration requires greater energy with limited service advantage as station intervals increase. Strict control of station stop times can effectively reduce overall journey timing. Optimum steepness of grades is defined in relation to energy demand and to stopping at stations.

Grant, JC (Mott Hay and Anderson) *Railway Engineer* Vol. 1 No. 4, Aug. 1976, pp 14-16, 7 Fig.

182

ORDER FROM: Mechanical Engineering Publications Penthouse 1, 15 West 55th Street, New York, New York, 10019

DOTL JC

16 141577

**RAIL CAR ROUTES AND FUEL CONSERVATION**

With fuel conservation in mind, this paper discusses fuel implications of routing rail freight cars by more direct and "fuel-efficient" routes, rather than by those which are circuitous and less fuel efficient. It is suggested that both shippers and railroads need voluntarily to be conscious of fuel conservation needs as they determine routings for rail cars.

Allman, WP (Department of Transportation) *ICC Practitioners' Journal* Vol. 43 No. 6, Sept. 1976, pp 734-739, 7 Ref.

ORDER FROM: Association of Interstate Commerce Comm Pract 1112 ICC Building, Washington, D.C., 20423

DOTL JC

16 141689

**A NATIONAL PLAN FOR ENERGY RESEARCH,  
DEVELOPMENT AND DEMONSTRATION: CREATING ENERGY  
CHOICES FOR THE FUTURE. 1976 VOLUME 2: PROGRAM  
IMPLEMENTATION**

This volume describes energy development programs now underway and supported by the federal government. It does not include energy research and development in industry or elsewhere unless federal funds are involved. Together with Volume I it describes technologies being investigated and activities in progress or planned in federal energy research. It presents ERDA's views on the courses of action that the federal government should take in assisting the private sector in finding solutions to the national energy problem.

See also Volume 1, The Plan (ERDA 76-1).

Energy Research and Development Administration R&D Rpt. ERDA 76-1, 1976, 438 pp, Tabs., 1 App.

ACKNOWLEDGMENT: Energy Research and Development Administration  
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GPO-052010004921

16 141690

**A NATIONAL PLAN FOR ENERGY RESEARCH,  
DEVELOPMENT AND DEMONSTRATION: CREATING ENERGY  
CHOICES FOR THE FUTURE. VOLUME 1: THE PLAN**

New technology that will help expand domestic energy supplies and improve the efficiency of energy use is an essential tool in achieving federal energy goals. Such technology requires a major national effort in research, development and demonstration, carried out largely in the private sector but supplemented by government sponsored RD&D where necessary. The chapters: The national energy problem and the nature of its solution; Fundamentals of the plan; The plan and the federal energy RD&D program for FY 1977; Implementing the plan: interrelationships among energy RD&D participants; Implementing the plan: ERDA planning system; Factors influencing the evolution of the plan; Future evolution of the plan.

See also Volume 2, Program Implementation (ERDA 76-1).

Energy Research and Development Administration R&D Rpt. ERDA 76-1, 1976, 130 pp, Figs., Tabs., Refs., 2 App.

ACKNOWLEDGMENT: Energy Research and Development Administration  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO-052010004786

16 142287

**EVALUATING A WASTE-OIL RECLAMATION SYSTEM**

Currently, only a small portion of industrial oils (industry estimates range from 2 to 5 percent) is being recycled, the rest winds up being spread on dirt roads, burned as fuel oil, or just dumped somewhere. Most plant engineers realize that recycling is probably the only realistic solution to the problem today, but the question is: "How?" If solid particles were the only contaminants in used plant lubricants, a simple filtration setup would provide the answer. Unfortunately, that is not the case, but modern lubricant-recycling systems can be designed to handle almost any contami-



nant problem. The article discusses important factors to be considered in evaluating oil reclamation systems, including type of oil, contaminants, quantities, filters and costs.

Allen, JL (Allen Filters, Incorporated) *Plant Engineering* Vol. 30 No. 9, Apr. 1976, pp 255-257

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

16 142289

**POUR-DEPRESSANT ADDITIVES FOR DIESEL FUELS**

Straight-chain alkanes, when added to diesel fuel in amounts of 5% or more, harm the low-temperature characteristics of the fuel. The presence of these hydrocarbons produce sharp increases in the cloud point, filterability temperature, and solid point of diesel fuels, and it is found that these three temperatures tend to converge when the n-alkanes are present. Results of an experimental study are presented which show that the most effective pour-depressant additives are those containing such structural elements as an ester group in an aliphatic chain with olefinic bonds, the total mol. wt of such additives must be several times the mol. wt of the diesel fuel. A given pour-depressant additive manifests identical effectiveness in fuels of a given hydrocarbon composition, including fuels with similar contents of n-alkanes.

Lebedev, SR Berezina, RM Chertkov, YB *Chemistry and Technology of Fuels and Oils* Vol. 11 No. 9/10, 7509, pp 811-814, 5 Ref.

ACKNOWLEDGMENT: EI  
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16 142295

**SPEED, COSTS, AND ENERGY CONSUMPTION IN RAIL TRANSPORT**

No Abstract.

Maternini, M *Rail International* Vol. 7 No. 9, Sept. 1976, pp 502-526, 14 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

16 142311

**THE ENERGY SOURCES FOR ELECTRIFICATION**

[Energeticeskaja baza elektrifikacii]

The article examines the two basic elements of railway electrification in the USSR: it gives the main parameters concerning fuel extraction and electric energy production, and goes on to explain prospects for continuous development of energy sources. [Russian]

Nekrasov, AM *Zheleznodorozhnyi Transport* No. 6, 1976, pp 16-19, 3 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novo-Basmanaya 4, Moscow B-174, USSR

16 142937

**ENERGY INTENSIVENESS OF INTERCITY MOTOR COMMON CARRIAGE OF GENERAL FREIGHT: ITS MEASUREMENT AND THE EFFECT OF FEDERAL REGULATION**

Questions regarding validity of simple BTU per ton-mile measures of energy intensiveness of several modes of transportation have been raised. As applied to intercity truck and rail freight, the measure ignores variables such as the transportation markets served, differences in density and packaging of cargo carried, and differences in characteristics of the actual transportation performed by each mode. The energy intensiveness of the entire production and physical distribution process is not addressed. The effect of federal regulation on the energy intensiveness or economic efficiency of the motor carrier industry has not been shown conclusively, although a study initiated by ICC in 1976 should be the source of important data.

Seventeenth Annual Meeting of the Transportation Research Forum, Beyond the Bicentennial: The Transportation Challenge, held in Boston, Massachusetts, October 28-30, 1976.

Eastman, SE (Economic Sciences Corporation)  
Cross (Richard B) Company Proceeding 1976, pp 17-27, 5 Tab., 16 Ref.  
ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

16 143680

**MANPOWER, MATERIALS, EQUIPMENT, AND UTILITIES REQUIRED TO OPERATE AND MAINTAIN ENERGY FACILITIES**

Operating and maintenance manpower, materials, equipment and utility requirements for typical examples of energy production, transportation, and conversion facilities are given. The 67 facilities analyzed cover a wide range of activities, including mining, transportation, fossil fuel conversion, nuclear fuel production and reprocessing, and electric power generation.

See also PB-245382, and PB-245383. Prepared by Stanford Research Inst., Menlo Park, Calif. Center for Energy Studies.

Bechtel Corporation, National Science Foundation, Stanford Research Institute, (SRI-3846) 18, Mar. 1975, 462p

Contract NSF-C867

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255438/4ST, DOTL NTIS

16 143963

**ENERGY SAVINGS RESULTING FROM MODAL SHIFTS TO CORRIDORRAIL**

A high speed passenger rail service between Washington and Boston was called for in the Regional Rail Reorganization Act of 1973. Planning for the service has been conducted by the Office of Northeast Corridor Development in the Federal Railroad Administration. Engineering studies were undertaken to develop detailed plans and costs for the required facilities improvements. This report examines train resistance, train performance, train energy consumption, and area energy use characteristics.

Sokolsky, S  
Aerospace Corporation, Transportation Systems Center, Federal Railroad Administration, Federal Railroad Administration FRA/NECPO-76/15, July 1975, 34 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257409/3ST, DOTL NTIS

16 145160

**INDUSTRY-BRANCH UNIFICATION OF DIESEL OIL GRADES**

This paper reports on the standardization of lubricating oils and fuels used in Diesel engines in the USSR. Diesel oil users are listed along with purpose and type of Diesel engines. Grades of oil recommended for engine operation on various grades of Diesel fuel are tabulated. Standardized testing is also dealt with in this report.

Reznikov, VD Shkol'nikov, VM *Chemistry and Technology of Fuels and Oils* Vol. 11 No. 9, Sept. 1975, pp 796-798, 2 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

16 145162

**EFFECT OF NATIONAL TRANSPORTATION/ENERGY POLICY ON REGIONAL TRANSPORTATION PHENOMENA**

Most regional transportation modeling studies have focused on microlevel phenomena operating within the region. In contrast, the model presented in this paper utilizes a hierarchical causality approach to examine the impact of higher-level (i.e., national policies on macrolevel regional transportation characteristics. Specifically, the individual and joint effects of national trends in gasoline price, transit funding, and fuel economy of automobiles are examined with respect to their influence on two Sacramento regional variables: transit usage and transportation fuel consumption. The authors conclude that given the uncertain future of causal forces that are beyond the region's control (e.g., gasoline price), a macrolevel analysis may be a more judicious use of limited transportation planning resources.

Flory, JE (California University, Davis); Pearce, MA Hunter, PJ Mosman, NJ *Simulation* Vol. 26 No. 4, Apr. 1976, pp 105-110, 50 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

16 145163

**ENERGY RESOURCES AND SUPPLY**

The first three chapters of the book form a general introduction, in which problems are outlined and natural energy flows on the Earth are related to the incoming solar flux. This demonstrates ultimate dependence on the Sun for most of our energy resources and all of our food. Next, fossil fuels and their exploitation, electricity generation and nuclear power are discussed, and the treatment of resources ends with a consideration of natural power supplies. Emphasis is then transferred from resources to the associated problems of waste, transmission, and storage, and the book ends with a chapter on the impact of the energy industries on people and a brief discussion of energy policy for the future.

Wiley (John) and Sons, Incorporated, (ISBN-0-471-58975-6) 1976, 508 pp

ACKNOWLEDGMENT: ASME Journal of Mechanical Engineering  
ORDER FROM: Wiley (John) and Sons, Incorporated 605 Third Avenue,  
New York, New York, 10016

16 145753

**FUTURE ENERGY SOURCES**

Potential energy resources of the world are surveyed, and U.S. energy reserves from fossil fuels and nonbreeder nuclear fission fuel are discussed. With petroleum and natural gas being rapidly depleted, the role that products from gasification and liquefaction of coal and oil shale will contribute is examined. The U.S. has over 50 nuclear power plants that supply about 7.5 percent of electrical power production presently; projections show 200 such plants in operation to supply 35 percent by 1985 and over 1000 by the year 2000 to supply over 60 percent. Geothermal energy is presently supplying economical production of electricity, process heat, and agricultural and space heating; in twenty years the amount of geothermal energy being used will depend on the way it is developed and on the costs of alternatives. Combined with energy conservation measures, solar energy can supply up to 50 percent of the energy needs by the year 2000. The potential of each method for nuclear fusion--magnetic confinement and laser-produced--is summarized briefly. (ERA citation 01:016337)

Proceedings of the western electronic show and convention, San Francisco, California, USA, 16 Sep 1975.

Berk, HL Post, RF Rinde, J  
California University, Livermore, Energy Research and Development  
Administration CONF-750909-2, July 1975, 14 pp

ACKNOWLEDGMENT: NTIS  
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UCRL-77007, DOTL NTIS

16 147579

**THE IMPACT OF THE U.S. ENERGY SITUATION ON HIGH SPEED GROUND TRANSPORTATION**

U.S. energy supply issues for the next few decades are summarized with a view toward their impact on high speed ground transportation (HSGT) modes. As background, the energy characteristics of intercity passenger modes, including 300 mph tracked levitated vehicle (TLV) systems, are presented and discussed. In the short and mid terms (through 1985 or 1990), energy shortages are seen to impact HSGT modes mainly through increased operating (fuel) costs; and the need for greater capacity flexibility. In the long term, HSGT modes may have to adapt to non-fossil fuels. Research topics for addressing energy impacts on HSGT are suggested.

Research sponsored by the FRA, Office of Research, Development and Demonstration.

Fraize, WE  
Mitre Corporation, (MTR-6808) Tech. Rpt. FRA-OR&D-75-63, Dec.  
1975, 41 pp, 14 Fig., 3 Tab., 17 Ref., 1 App.

Contract DOT-FR-30015

ACKNOWLEDGMENT: FRA  
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BP-261805/AS, DOTL NTIS

16 147590

**ETA: A MODEL FOR ENERGY TECHNOLOGY ASSESSMENT**

This article explores some of the options by which the U.S. could move away from its present heavy dependence upon oil and gas toward a more

diversified energy economy. Through nonlinear programming, our model incorporates both own-and cross-price elasticities of demand. In this way, it allows for price-induced interfuel substitution and energy conservation. Among the supply options studied are: direct combustion of coal to generate electricity; conversion of coal to synthetic fuels; nuclear energy--first from the light water reactor and later from the fast breeder; hydrogen via electrolysis; and distant future technical options such as fusion and central station solar power (aggregated and described only as an "advanced technology"). Each energy source has its own cost parameters and introduction date, but is interdependent with other components of the energy sector. For example, the amount of coal consumed in electric power plants can affect the marginal cost of production--and hence the cost of coal-based synthetic fuels for nonelectric energy. The converse is also true. Thus, it is not sufficient to look at individual technologies in isolation. We must attempt to compare their effects upon the system as a whole.

Manne, AS (Harvard University) *Bell Journal of Economics* Vol. 7 No. 2, Sept. 1976, pp 379-406, Figs., Tabs., Refs., 1 App.

ACKNOWLEDGMENT: American Telephone and Telegraph Company  
ORDER FROM: ESL

16 147828

**PASSENGER TRANSPORT: SHORT AND MEDIUM TERM CONSIDERATIONS**

High proportion of passenger traffic moves by road. Traffic by road has been increasing in both volume and as a proportion of the total, and current forecasts envisage that these trends will continue, unless reversed as a result of action by central or local government authorities. This paper is in essence a survey of passenger traffics, their energy usage (illustrated by statistics some of which have not hitherto been generally available) and the bearing of these upon transport and energy policies.

Department of Energy, England No. 10, 1976, 16 pp

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Her Majesty's Stationery Office P.O. Box 569, London SE1  
9NJ, England

16 147834

**EXTENDED RELUBRICATION PERIOD FOR RAILROAD ROLLER BEARINGS**

At the present time, railroad roller bearings, with rotating axle end caps operating in interchange service, are relubricated every forty-eight months with Grade B grease, which is to AAR Specification M-917-64. Field inspections have indicated that over-lubrication has caused an increase in the number of bearings being set out due to overheating. These inspections indicate that relubrication can be extended beyond the present four-year period. Some of the Grade B greases are not stable and not desirable for extended relubrication. With the simulated service mechanical stability test as a requirement in the proposed AAR Grease Specification M-942, this problem should be eliminated. Laboratory tests have been made by the author's company on a grease which meets the proposed AAR Grease Specification. The tests confirm that bearing fatigue life can be increased and that bearings will operate satisfactorily under cold conditions as well as normal service. These requirements are also desirable for extended relubrication. This paper will describe the changes that have been made in the past for relubrication of freight car roller bearings and then will outline why relubrication can be extended beyond the present four-year period if the proposed AAR Grease Specification is adopted.

Jones, HM (Timken Roller Bearing Company, Incorporated) *Lubrication Engineering* Vol. 32 No. 7, July 1976, pp 336-44

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

16 147835

**QUALITY CONSIDERATIONS FOR RAILROAD ROLLER BEARING GREASES**

Certain aspects of grease quality are presented which are of major importance in greased railroad roller bearing performance. The grease components or properties which are most likely to affect each of these quality aspects are discussed. Similarly, for each aspect of quality presented, inspection tests are suggested to 1) evaluate the quality level of a given grease

product, and 2) insure the maintenance of this quality level in subsequent preparation of the same grease.

Hartin, GL *Lubrication Engineering* Vol. 32 No. 7, July 1976, pp 345-352

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

16 147837

#### INTERMODAL COMPARISONS OF ENERGY INTENSIVENESS IN LONG-DISTANCE TRANSPORT

This note compares various figures for direct EI (Energy Intensiveness) for different modes of long-haul passenger and freight transport. The author comments on the high EI of superfast rail travel, especially where trains must pass through tunnels, and refers to a study dealing with power requirements for pushing trains through long tunnels.

Seymer, N *Transportation Research* Vol. 10 No. 4, Aug. 1976, pp 275-279

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

16 147859

#### TAMING THE TRANSPORT TIGER

Mechanised transport uses nearly 20 percent of the useful energy available in Britain, and almost one third of the petroleum products. Although the contribution of transport to economic and social progress is often ignored, the author examines means of minimising energy requirements by increasing efficiency of power plants, substitution of scarce or expensive fuel, and reducing demand. It is unlikely that battery powered vehicles could be made to function more efficiently than those powered by the internal combustion engine. Energy savings by a shift to rail transport would be small if road journeys at either end of rail travel were not eliminated. There is little sign that less expensive public transport can attract those with private cars readily available. The author argues that the demand for transport may reflect a failure to organise society efficiently and equitably; transport restraint may force a re-examination of the present pattern of activity with a resultant improvement in the style of life. /TRRL/

Silverleaf, A *New Scientist* Vol. 72 No. 1022, Oct. 1976, pp 12-13

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-222945)  
ORDER FROM: IPC Magazines Limited 66-69 Great Queen Street, London WC2E 5DD, England

16 147860

#### RAW MATERIAL SOURCES AND TRANSPORT

This paper commences by reviewing the development of primary energy consumption and the dependence on imported energy in Europe, the USA and Japan. Energy requirements and the use of petroleum products in the transport sector is then analysed, as is the cycle of world oil production from 1900 onwards, forecasting trends up to 2100. Finally, transport policies are discussed in relation to energy consumption, and the implications in fuel and cost saving measures such as improved car technology, changes in passenger and freight modal splits, and physical constraints such as fuel rationing and changes in the internal organisation of individual modes. The number of the covering abstract for the symposium is IRRD no. 221684. /TRRL/  
Presented at the Sixth International Symposium on Theory and Practice.

Bayliss, B (Bath University, England)

OECD Publications Office Conf Paper 92-821-1036-2, 1976, pp 107-43, 2 Fig., 12 Tab., Refs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-222850)  
ORDER FROM: OECD Publications Center 1750 Pennsylvania Avenue, NW, R1207, Washington, D.C., 20006

16 147873

#### RAW MATERIAL RESOURCES AND TRANSPORT

In this paper six chapters deal separately with: 1. The historical background to modern transport and the transport revolution as a decisive factor in the changes affecting agriculture, industry and energy in the 19th and 20th

centuries. 2. The basic features of the energy equilibrium. The three post-war periods: pre-1958; 1958-1972; post-1972. 3. Transport of energy and raw materials since the end of the second world war and the outlook for the decade 1975-1985. 4. Government energy policies following the 1973 crisis, and their possible impact on transport. 5. The long-term prospects arising from the effects on transport of the changes in energy availability. 6. Conclusions. The number of the covering abstract for the symposium is IRRD no. 221684. /TRRL/

Presented at the Sixth International Symposium on Theory and Practice.

Hatry, P (Brussels University, Belgium)

OECD Publications Office Conf Paper 92-821-1036-2, 1976, pp 145-192, 4 Tab., 18 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-222851)

ORDER FROM: OECD Publications Center 1750 Pennsylvania Avenue, NW, R1207, Washington, D.C., 20006

16 148269

#### REDUCING ENERGY CONSUMPTION THROUGH TRAJECTORY OPTIMIZATION FOR A METRO NETWORK

The problem considered is the determination of tunnel trajectories in the "equivalent" vertical plane when trains traveling in both directions must follow the same trajectory. The problem is first formulated as a control problem with control and state constraints. Then, under certain simplifying assumptions, an heuristic method employing a direct search algorithm is presented and used in the trajectory optimization. The trajectories are optimized to reduce the sum of the energy consumed by the trains traveling in both directions on the trajectory. The results show an average reduction of 7.73 percent in energy consumption as compared with existing trajectories.

Hoang, HH (Ecole Polytechnique, Canada); Polis, MP Haurie, A *IEEE Transactions on Automatic Control* No. 5, Vol. AC-20, Oct. 1975, pp 590-595, 8 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

16 148288

#### ENERGY CONSERVATION IN TRANSPORTATION

The use of energy for transportation is reviewed and various aspects of energy conservation are discussed. These include an examination of energy savings achievable with existing technology with examples in the Pacific Northwest, and a review of predicted savings based on future technology.

This paper was presented at the Thermal Power Conference, Washington State University, Pullman, October 15-17, 1975.

Dickinson, JT

Washington State University Conf Paper 1975, pp 179-189, 4 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Washington State University College of Engineering, Pullman, Washington, 99163

16 148302

#### MINICOMPUTER AUTOMATES LUBE-OIL TESTING

Through use of a minicomputer data-acquisition and test-monitoring system, Southwest Research Institute engine laboratory, which is engaged in testing lubricating oils and other automotive products, can gather ten times as much data, with greater accuracy than is possible manually. As many as 50 engines can be operated simultaneously to perform any of the eight different programmed qualification tests required by US Army specifications. The automated laboratory is operated by a Hewlett-Packard 2100A real-time minicomputer system with 24K memory and various signal-conditioning and scanning electronics for taking readings. As well as input/output peripherals.

*Power* Vol. 120 No. 8, Aug. 1976, pp 50-51

ACKNOWLEDGMENT: EI  
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17 130276

**AUTOMATED RAILROAD TRANSPORT CONTROL SYSTEM: TASKS, REQUIREMENTS, OUTLOOK [Asuzht: zadachi, trebovaniia, perspektivy]**

The main task in redesigning the transport control system is the creation, based on computers and automation, of a new concept in which would be realized optimum conditions for development of process control. Over 50 types of tasks can be solved with the aid of the computer: calculation, analysis, normalization, planning and prognosis. Specific instances include improved car turnaround, improvement of locomotive utilization, increase of throughput capacity, and other technical improvements. ASUZHT has a three-step plan, based on the main computer center of the Ministry of Railroads, the network of on-line computer centers and the major terminals with refined data transmission arrangements. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

*Zheleznodorozhnyi Transport* No. 2, 1975, pp 2-10, 7 Photo.

ACKNOWLEDGMENT: FRA

ORDER FROM: *Zheleznodorozhnyi Transport* Novo-Basmanaya ul. 4, Moscow B-174, USSR

17 130278

**COMPLEX AUTOMATED RAILROAD TRANSPORT CONTROL SYSTEM [Kompleksnaia avtomatizirovannaia sistema upravleniia zheleznodorozhnym transportom]**

The twenty-sixth Congress of the U.S.S.R. Communist Party paid great attention to the improvement of planning and control on the basis of widely applied mathematical methods, the use of electronic computational and organization technology, and communication. This report discusses the experience of the application of computers on railroads, covering schemata for normalized freight flow directions, monthly plans for transport, monthly technical normalization of operations, plan for the formation of freight trains, traction calculations, creation of the train schedule, a system of operational planning for maintenance work, the automation of cash-ticket operations and reservations on trains, and basic work on the creation of statistical and book-keeping accounts. The report goes on to cover the tasks and plans for the creation of a complex automated system of rail transport control (ASUZHT), presenting detailed block schemata and covering functional subsystems, and information base, and the technical complex. In final phase the ASUZHT is envisaged to automate tracing of its rolling stock and regulation of maintenance work with the use of automated data processing, including the creation of an information bank and the creation and optimization of a dynamic model of the transportation process. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Petrov, AP *Zheleznodorozhnyi Transport* No. 10, 1973, pp 37-47, 2 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: *Zheleznodorozhnyi Transport* Novo-Basmanaya ul. 4, Moscow B-174, USSR

17 130280

**ELECTRONIC COMPUTERS AND CONTROL OF THE TRANSPORT PROCESS [EVM i upravlenie perevozchnym protsessom]**

Under present conditions of scientific and technical progress, control over the production process becomes more and more complex and requires the direct treatment of a large volume of information, intensification of the role of economic controls, and the application of economic mathematical methods. Further improvement of the level of control is possible with the use of computers. The first step of ASUZHT is the information planning system (IPS), which includes, along with the means of calculation technology, the technology of collection and transfer of information, technical devices for transfer of data, and mathematical provisions for the solution of problems. Planning of train make up is realized on the road with the help of computers. The following problems are solved: elaboration of plans for the arrival of trains into the stations at four hour intervals, plans for classification, definition of proper time for forming the blocks. A whole series of analytical and engineering tasks are solved with the aid of calculation technology, thereby greatly reducing time expenditures. The

application of the means of calculation technology will have a large economic and social effect, freeing large numbers of workers from unproductive manual treatment of information, and allowing them to more deeply and thoughtfully realize control over the transport process. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Krivosos, PF *Zheleznodorozhnyi Transport* No. 5, 1972, pp 10-16, 3 Fig., 4 Phot.

ACKNOWLEDGMENT: FRA

ORDER FROM: *Zheleznodorozhnyi Transport* Novo-Basmanaya ul. 4, Moscow B-174, USSR

17 130281

**THE ORGANIZATION OF AN INFORMATION BASE AND DATA BANK FOR AUTOMATING THE CONTROL OF THE TRANSPORT PROCESS [Organisatsiia informatsionnoi bazy i "banka" dannykh dlia avtomatizatsii upravleniia perevozchnym protsessom]**

A railroad involves complex, multi-branch management consisting of various production subdivisions and major supporting enterprises. If it is perceived as an object of control, it is possible to divide it into two main links: the first is the control of the transport process, and the second is control of material production (repair of rolling stock, track, material and technical supply, etc.), ensuring the functioning of the first link. The main body of this document provides a detailed explanation for the inter-relationships of the various components of the information process; these are summarized in a block plan and include the logic control block, the central data bank, the specialized data files, the file of the control logic, and the output information. The volume of information treated consists of over five million characters per twenty-four hour period. On the basis of the transmitted data there is created in a central data bank in the computer full information about the network operation. From the central data bank there are created specialized instructions for the control of the road subdivisions: the stations, cargo turnover points, container areas, etc. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Bylinskii, Iu V *Avtomatika, Telemekhanika i Svyaz* 1974, pp 28-30

ACKNOWLEDGMENT: FRA

ORDER FROM: *Mezhdunarodnaya Kniga Smolenskaya sennaya pl.* 32-34, Moscow G-200, USSR

17 130283

**TRANSPORT CONTROL AUTOMATION [Avtomatizatsiia upravleniia perevozkami]**

The Gorkovskij main line connects by the shortest possible route the heavy economy regions of the Center with the Urals and Siberia, and serves the industry and agriculture of the central Volga region. Over the last four years of the five-year plan the volume of transport on this road increased by almost 40% and in 1974 had already attained the level planned for the end of the five-year plan. In order to cope with the growing volume, electronic computational technology was widely used, allowing the simultaneous calculation of quickly-varying circumstances, the choosing of optimal variants of planning, control, and production of transport. An automated control system (ASU) for operation of the road, created on the basis of computers and mechanisms for the remote transmission of information significantly accelerates the reception and increases the reliability of a great amount of information necessary for the optimization of control over the transport process. A series of engineering and calculation tasks connected with the planning and control of main line operations are also solved. With the help of the computer monthly transport plans are worked out; on the basis of the dispatchers' announcements freight handling is elaborated according to type of cargo, department, and entire road. This report also includes a section on planning the operations of the classification yards, the collaboration of workers of main line and industrial transportation, and the experience of initiators of competition, and unique technology. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Volkov, VA *Zheleznodorozhnyi Transport* No. 7, 1975, pp 20-28, 3 Fig., 5 Phot.

ACKNOWLEDGMENT: FRA

ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmannaya ul. 4, Moscow B-174, USSR

17 130284

#### AUTOMATED CONTROL OF THE TRANSPORT PROCESS

[Avtomatizirovanoe upravlenie perevozochnym protsessom]

The transfer to automated operational control over the transport process on a series of roads began with the autonomous planning on electronic computers of the work of the classification yards. This is connected with the possibilities of the presently utilized means of computational and data transfer technology. Experience on several roads revealed the need and possibility for constructing more flexible automated systems ensuring the reception by train traffic controllers of operational integrated information and railcar flows and locomotives under conditions of changing train circumstances. The following functional steps can be defined in the operational control process, corresponding in equal degree to all levels of control (stations, terminal, section, division, and entire road): control over the fulfillment of the transport process, technological and technical normalization, planning (current, etc.) and actual control corresponding to various levels (type of train, autodispatcher, station autodispatcher). This report goes on to cover the collective system, by which users located at distant points have, through the data transmission devices (terminals) immediate access to the data information bank in the computer's memory, for solving tasks within a realistic time range. The report goes on to describe the development of the system, and complex methods for utilizing locomotives. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Priklonskii, VV Azarov, IV *Zheleznodorozhnyi Transport* No. 9, 1975, pp 37-42

ACKNOWLEDGMENT: FRA

ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmannaya ul. 4, Moscow B-174, USSR

17 130285

#### AUTOMATED CONTROL SYSTEM FOR THE TRANSPORT

PROCESS [Avtomatizirovannaiia sistema upravleniia perevozochnym protsessom]

The Belorussian road is a heavy industrial subdivision which unites hundreds of self-sufficient enterprises and organizations. The massiveness and large volumes of transport, the necessity for accurate regulation of tens of thousands of railway cars and locomotives, and the realization of control over a continual process of transport requires the improvement and perfection of the organization for control of the operation of the road. An optimal system of control can be ensured under conditions of wide application of mathematical and economical methods and electronic computational technology, that is by creation of an automated system of control over the operation of the railroad ASUZHT). In order for ASUZHT to effectively fulfill the functions of normalization, computation, analysis, planning, and control, it is necessary to prepare cadres, accurately define all tasks, create an insurance portion of ASUZHT which includes an informational base, a technical means complex, and the mathematical ensuring of the system in order to solve tasks in established time periods with the least possible expenditure of labor. The preparation of cadres for normal functioning includes not only manning and preparation of personnel connected with immediate maintenance and repair, the elaboration of programs, procedures, treatment and processing of information, but also the corresponding preparation of controllers, those who carry out work in the enterprises, departments and management centers on the road and who are concerned with the preparation, collection, and transmission of production information. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Iushkevich, EP *Zheleznodorozhnyi Transport* No. 11, 1975, pp 24-29, 2 Fig.

ACKNOWLEDGMENT: FRA

ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmannaya ul. 4, Moscow B-174, USSR

17 131876

#### TRAIN PERFORMANCE CALCULATOR

Computer program is a modified version of EMD's Fortran II TPC program which calculates the minimum run time over a track segment and the corresponding fuel consumed for a given train description.

Direct requests to L.A. Thomas, Director Operations and Budget Planning, St. Louis-San Francisco Railway.

St Louis - San Francisco Railway Company No Date

ACKNOWLEDGMENT: St Louis - San Francisco Railway Company

ORDER FROM: St Louis - San Francisco Railway Company 3253 East Trafficway, Springfield, Missouri, 65802

17 131879

#### MOVE CODES-LOGIC AND STRUCTURE

This computer program involves move codes that are tables, defined for each of eighty-five major terminals, which specify how an outbound car is to be handled, based on the final destination of the car. Tables specify trains on which car is eligible to move, next destination of each eligible train, block in which car is to be placed, the next security check point and tonnage translation code. Through the use of Move Codes, it is possible to define acceptable routes between specified points and to predict total transit time. Tonnage reports of cars on hand in the yard, accumulated by selected next destinations are produced upon inquiry from real time system. Connection reports are produced at selected locations to determine performance against a plan.

Direct requests to J.R. Martin, AVP, Transportation Planning, Southern Railway.

Southern Railway System No Date

ACKNOWLEDGMENT: Southern Railway System

ORDER FROM: Southern Railway System 125 Spring Street, SW, Atlanta, Georgia, 30303

17 134683

#### INTERACTIVE GRAPHICS SYSTEM FOR TRANSIT ROUTE OPTIMIZATION

A person-computer interactive graphics system for optimizing the routing structure on an urban transit network is presented. The system allows a user to design bus, streetcar, and subway routes on a display scope and to specify route frequencies and types of vehicles. The computer predicts the effects of the routing structure by assigning potential transit trips to the network and it displays the route loadings along with statistics on travel times, rolling stock use, and operating costs. After evaluation, the user can partially or totally modify his or her designs and thereby move toward routing schemes that come closest to planning objectives. The system is based on a multipath transit assignment model that is a further development of R. B. Dial's stochastic assignment algorithm. The model is implemented on a CDC 7326 series computer with a display scope, and it has been tested by being applied to the Lausanne, Switzerland, public transit system. A second implementation of the model has been realized on a small computer environment and is being used productively for optimizing the 24-route tramway and bus network of Basel, Switzerland. The methodology and some results of these applications are described.

Rapp, MH Mattenberger, P Piguat, S Robert-Grandpierre, A *Transportation Research Record* No. 559, 1975, pp 73-88, 16 Fig., 1 Tab., 9 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

17 137034

#### A USER'S GUIDE TO CONSTRAINED BIPROPORTIONAL MATRIX ESTIMATION

This report is one of a series being written for the University Research Program, U.S. Department of Transportation, to present analyses of the results obtained using the multiregional input-output (MRIO) model for the United States. The present report contains a guide to a number of computer programs that are used to adjust the set of multiregional input-output trade flows to be consistent with control totals from the regional input-output tables. It is based upon research completed by Malte Mohr and reported in his Ph.D. thesis, which is entitled "A Consistency Problem of Multiregional Input-Output (MRIO), and Existence Conditions of Constrained Biproportional Matrices."

Mohr, M  
Massachusetts Institute of Technology, Department of Transportation  
Final Rpt. DOT/TST-76/62, Sept. 1975, 42 pp

Contract DOT-OS-30104

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-253583/9ST, DOTL NTIS

**17 137057**  
**DATA MANAGEMENT METHODS FOR URBAN MASS**  
**TRANSPORTATION SYSTEMS**

The report describes a computer based Data Management and Retrieval System for the Urban Mass Transportation Industry. The System is designed to aid the transportation planner, engineer, and manager in solving recurring problems associated with (1) collection; (2) categorization and synthesis; (3) storage and (4) retrieval of urban mass transportation information. The system is designed to be used by personnel without formal computer training with the everyday vocabulary associated with many classes of rapid transit operation, evaluation, and studies. The features and use of an example system is described for rail rapid transit noise abatement studies. The example system combines (1) physical data describing the system and (2) measured noise levels as an aid in evaluating cost effective acoustic treatments for lowering rail rapid transit noise.

Priemer, R Silver, ML  
Illinois University, Chicago, Urban Mass Transportation Administration,  
(UMTA-IL-11-0007) Res. Rpt. UMTA-IL-11-0007-75-1, Sept. 1975, 77  
pp

ACKNOWLEDGMENT: NTIS  
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PB-254798/2ST, DOTL NTIS

**17 137333**  
**COMPUTER GRAPHICS APPLICATIONS IN**  
**TRANSPORTATION INFORMATION SYSTEMS**

This paper reports on the results of the application of interactive computer graphics to those public transportation information systems which answer inquiries from the general public. Primary emphasis was placed on development of a graphics application package to control the existing Transit Information System developed by the Stanford/UMTA research group in the Stanford Industrial Engineering Department. Other areas of investigation included operator interaction with the computer display; sorting and searching a large geographic data base; and the practical limitations of geographic displays on a CRT. The U.S. Census Bureau's DIME data base was analyzed, and an interactive graphics map editor was developed.

Wingate, FB  
Stanford University, Urban Mass Transportation Administration, (UM-  
TA-CA-11-0008) Res. Rpt. RR-23, UMTA-CA-11-0008-75-1, Aug.  
1975, 36 pp

ACKNOWLEDGMENT: NTIS  
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PB-254795/8ST, DOTL NTIS

**17 137346**  
**TRANSPORTATION SYSTEM ASSURANCE: TERMINOLOGY,**  
**PERFORMANCE INDICES, FAILURE ASSESSMENT AND**  
**MAINTENANCE MANAGEMENT**

The paper addresses the need for and reports on the development of a methodology for consistent measurement of reliable performance in transportation operations which include intercity rail, urban commuter rail, rapid transit, bus and streetcar, light rail and small people movers. Performance indices and formulae for their computation are developed as a compromise between industry tradition and modern assurance science techniques. Equipment availability, a generic reference to the reliability, maintainability, and availability of the equipment to transport passengers is discussed as it relates to both service dependability and the cost of the maintenance operation. A comprehensive Failure Assessment and Maintenance Management System (FAMMS) which is directly applicable to transportation properties and which evolved from similar systems used on properties over the past five years is described in detail. The system can be completely computerized and data can either be batch or on-line processed.

Uher, RA  
Carnegie-Mellon University, Urban Mass Transportation Administration,  
(UMTA-PA-11-0013) Res. Rpt. CMUTRI-TP-75-22, UMTA-PA-  
11-0013-75-1, Aug. 1975, 102 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-254837/8ST, DOTL NTIS

**17 139463**  
**AUTOMATIC MANAGEMENT SYSTEM FOR WAGON**  
**OPERATING [Avtomatizirovannaja sistema upravlenija vagonnym**  
**hozjajstvom]**

The article describes the constructional principles of an automatic management system (ASUZHT-W) for wagon operating; explains the link between this system and other automatic systems, in the context of the global automatic management system (ASUZHT) for Soviet rail transport; and lists the problems of ASUZHT-W, and shows how operational logical and technical reliability can be achieved. [Russian]

Kiriljuk, AV *Zheleznodorozhnyi Transport* No. 3, 1976, pp 59-61

ACKNOWLEDGMENT: UIC

ORDER FROM: Zheleznodorozhnyi Transport Novó-Basmanaya ul. 4,  
Moscow B-174, USSR

**17 139513**  
**STATISTICAL ANALYSIS AND MATHEMATICAL MODELS**  
**APPLIED TO ROLLING STOCK MAINTENANCE PROBLEMS**  
**[Analyse statistique et modeles mathematiques appliques a l'etude des**  
**problemes de l'entretien du materiel roulant]**

The author shows that the mathematical methods can be used in a number of ways for solving maintenance problems including determination of optimum sampling on which to base a test, forecast of work loads on the basis of models, and stock levels for certain spare parts. The article describes the methods employed: model methods, and statistical analysis methods. The predetermination of the maintenance cycle of a batch of electric locomotives is presented as an example. [French]

Dubedat, AM *Revue Generale des Chemins de Fer* Vol. 95 Feb. 1976, pp  
89-94

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**17 139642**  
**OPTIMAL CARGO VEHICLE FLOW PATTERNS FOR INLAND**  
**WATERWAY SYSTEMS**

In this paper is solved the following multicommodity, mixed fleet transportation problem: Given origin-destination matrices for two commodities, the first of which can be moved in both open hopper and covered hopper barges and the second of which must be moved in covered hoppers, find minimum cost origin-destination flows for loaded and empty hopper barges such that all commodities are moved and flow conservation conditions at each port are satisfied. A linear programming model of this problem is developed, and an efficient solution technique is presented. The model is then used to derive optimal barge flows for an inland waterway system. The effect of this flow optimization on system operations is then investigated, with the aid of an inland waterway simulation model.

Prepared for the 54th Annual Meeting of the Transportation Research Board.

Bronzini, MS (Georgia Institute of Technology) *Transportation Research Record Conf. Rpt.* No. 577, 1976, pp 1-12, 1 Fig., 5 Tab., 17 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

**17 139644**  
**THE TON-MILE: DOES IT PROPERLY MEASURE**  
**TRANSPORTATION OUTPUT**

The current unit of transportation, the ton-mile (megagram-kilometer), must be reevaluated. This paper traces the origins and uses of the ton-mile, exposes its shortcomings, and examines its current misuse as a measure not only of tons and miles (megagrams and kilometers) but also of efficiency,

competition, and productivity. The use of the ton-mile as a measurement has been responsible for many problems in transportation policies and is probably the principle reason that so much confusion and controversy exist with respect to the national transportation system today. The paper recommends gross freight revenue (or the value of transportation) as a far better measurement because it more accurately reflects the relative worth of the various modes to the national effort of moving goods. It is suggested that the Transportation Research Board address the matter as a problem deserving its full and immediate attention.

Prepared for the 54th Annual Meeting of the Transportation Research Board.

Flott, AC (American Trucking Associations); Batts, LR Roth, RD  
*Transportation Research Record* Conf. Rpt. No. 577, 1976, pp 19-26, 2 Tab., 16 Ref.

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DOTL JC

17 139646

**LINEAR PROGRAMMING SIMULATION OF ROUTING EMPTY RAILROAD CARS**

This paper describes the application of a linear programming model to the routing of empty railroad cars to determine where excess capacity exists. One of the more important results is simply that the solution of a model of this size and complexity is feasible. The model showed that there were a number of railroad routes over which an appreciable flow of empty cars moved and that filling these cars could provide very low cost transportation. Finally, the solution of the linear programming problem provides a series of shadow prices for cars in different locations that can be used in setting rates, which is a new approach to incorporating directional factors into rate setting.

Prepared for the 54th Annual Meeting of the Transportation Research Board.

Miller, E (U.S. Office of Management and Budget) *Transportation Research Record* Conf. Rpt. No. 577, 1976, pp 35-43, 1 Fig., 3 Ref.

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DOTL JC

17 142075

**A PLANNING MODEL FOR MULTIPLE-MODE TRANSPORTATION SYSTEM OPERATIONS**

The problem of generating a set of "good" transportation alternatives during the early and intermediate stages of transportation planning is addressed in this paper. A linear programming model of a multi-modal transportation system is developed. The model is run interactively to determine optimal operating levels for all modes for various transport policy decisions. The model described is a component of a composite network generation model incorporating dynamic changes. The linear programming component determines optimal operating policies for given points in time. The composite model incorporates these in a dynamic programming framework to determine optimal staged investment policies over several time periods. /Author/TRRL/

Nihan, NL (Washington University, Seattle); Morlok, EK  
(Pennsylvania University, Philadelphia) *Transportation Planning and Technology* Vol. 3 No. 2, 1976, pp 59-73, 4 Fig., 1 Tab., 4 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-220954)

ORDER FROM: ESL

17 142312

**AUTOMATIC CALCULATION OF A TRAIN FORMING SCHEDULE FOR EACH OF THE RUSSIAN RAILWAYS' NETWORKS [Rascet vnutridorozhnogo plana formirovaniya poezdov]**

The article describes a method for producing this calculation, as developed by the Railway Transport Research Institute of the Ministry of Communications. It also explains the calculation diagram for the optimum train forming schedule by network, which provides for improvement of the wagon flow programming system. [Russian]

Bujanova, VK *Zheleznodorozhnyi Transport* No. 6, 1976, pp 64-67

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR Novo-Basmannaya 4, Moscow B-174, USSR

17 142317

**METHODS TO SIMPLIFY NETWORK REPRESENTATION IN TRANSPORTATION PLANNING**

The problem of Network Aggregation is defined as the simplification of the number of nodes and links in a transportation network. The objective of a network aggregation technique is to reproduce the level-of-service attributes (such as travel time) between any two points using a spider network as a proxy for the detailed. The aggregation procedure categorizes links into functional groups such as access, egress, line-haul, bypass and intra zonal circulation—which is a convenient classification in terms of transportation analysis. The technique presented has several distinguishing advantages. First, certain invariance properties are maintained—for example the total trip miles of travel is the same whether measured in the aggregate or detailed networks. Second, the method is systematic, rather than judgemental, which means the inaccuracies introduced as a result of network aggregation can be measured in a scientific way.

Chan, Y (Pennsylvania State University, University Park) *Transportation Research* Vol. 10 No. 3, June 1976, pp 179-191, 15 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

17 143225

**EXPERIMENTAL TEST CONCEPT FOR A CARGO DATA INTERCHANGE SYSTEM (CARDIS). VOLUME I: TEXT**

This report includes the recommended CARDIS experimental test system functional capabilities. It identifies the CARDIS functions that are inherent to an information exchange capability and optional systems which are required by the transportation related industries. The criteria to evaluate the various system functions selected for implementation by test participants are included as are the CARDIS test objectives. Volume I contains the CARDIS test concept, functional analysis, and test objectives.

See also Volume 2, PB-256823.

Ruthling, C Penrose, W Wall, M  
Computer Sciences Corporation, Transportation Systems Center Final Rpt. DOT-TSC-OST-76-25-1, May 1976, 60 pp

Contract DOT-TSC-1026-1

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-256822/8ST, DOTL NTIS

17 143226

**EXPERIMENTAL TEST CONCEPT FOR A CARGO DATA INTERCHANGE SYSTEM (CARDIS). VOLUME II: APPENDIXES**

This report includes the recommended CARDIS experimental test system functional capabilities. It identifies the CARDIS functions that are inherent to an information exchange capability and optional systems which are required by the transportation related industries. The criteria to evaluate the various system functions selected for implementation by test participants are included as are the CARDIS test objectives. Volume I contains the CARDIS test concept, functional analysis, and test objectives. Volume 2 contains the details on CARDIS functional modules.

See also Volume 1, PB-256822.

Ruthling, C Penrose, W Wall, M  
Computer Sciences Corporation, Transportation Systems Center Final Rpt. DOT-TSC-OST-76-25-2, May 1976, 147 pp

Contract DOT-TSC-1026-2

ACKNOWLEDGMENT: NTIS

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PB-256823/6ST, DOTL NTIS

17 144082

**TRAIN REGULATION AND ROUTE-SETTING WITHIN AN INTEGRATED DATA PROCESSING SYSTEM**

German Federal Railway's Board of Management has approved the first stage of a system-wide computer project to handle all commercial transac-



tions, record and supervise rolling stock movements, and continuously monitor train running throughout the system. Costing DM600 million, this Integrated Transport Control system is based on a hierarchy of computers and installation is now in full swing. Development and design work is centered on the "cybernetic island" near Hannover which is now reaching the end of its service life. In setting up the "cybernetic island" the objective was to develop, test and evaluate control by computers of all operating and decision-making transport processes from acceptance of a consignment to its delivery to the consignee. This objective has been completely fulfilled.

Diener, R. *Railway Gazette International* Vol. 132 No. 10, Oct. 1976, pp 369-72, 3 Fig., 2 Ref.

ORDER FROM: ESL

DOTL JC

17 144088

**FREIGHT TRANSPORTATION. A DIGEST OF TECHNICAL PAPERS. VOLUME I**

This volume contains a number of technical papers dealing with intercity freight transportation. Collectively, these systems-oriented papers consider a wide range of subject matter including transportation facilitation, commodity flow, regulation, automatic control, demand modeling, transportation energy, evaluation of innovation, tariff computerization, network analysis and new concepts for freight transportation. In addition to those subjects that deal with the transportation system or process, there are papers that treat specific modal considerations. These include discussion of aerodynamic drag effects on rail piggyback operations, rail freight yard technology review, summary of motor carrier return on investment considerations in a regulated industry, results of pipeline studies and use of simulation for waterway navigation and control.

Transportation Systems Center DOT-TSC-OST-77-68, Oct. 1976, 202 pp, Figs., Tabs.

ACKNOWLEDGMENT: TSC  
ORDER FROM: TSC

17 145143

**DEVELOPMENT OF A REAL TIME COMPUTER ORIENTED LOCOMOTIVE MAINTENANCE PROGRAM**

The problems associated with the optimization and management of the maintenance of a large fleet of diesel electric locomotives are reviewed, and the development of a computer oriented program to direct maintenance is discussed. The program involves a real-time computer and program coupled with an interactive terminal network to direct and monitor maintenance activities at each shop. Present use of the program and further capabilities now under development are outlined.

Contributed by the Rail Transportation Division of The American Society of Mechanical Engineers for presentation at the Winter Annual Meeting, New York, N.Y., December 5, 1976.

Lee, JL (Seaboard Coast Line Railroad)  
American Society of Mechanical Engineers Conf Paper 76-WA/RT-10, Dec. 1976, 8 pp, 9 Fig.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

17 145155

**PRODUCTIVITY MEASUREMENT CONFERENCE**

This conference was aimed at identifying acceptable measurements of productivity. Part I is the formal program. Part II includes formal presentations and discussions of the first session which considered the following topics: Review of Productivity; Definition of Productivity; Measuring Motor Carrier Productivity; Measuring Railroad Productivity; Data Needs for Measuring Productivity. Part II consists of the summary reports and discussions for each group session, corresponding to the above topics. Part IV consists of appendices which include background material. These proceedings are offered as a resource document to serve as the basis for continuing discussion and research on productivity measurement.

Interstate Commerce Commission Proceeding Nov. 1974, 179 pp, Tabs., 4 App.

ORDER FROM: Interstate Commerce Commission 1112 ICC Building, Washington, D.C. 20423

DOTL RP

17 145544

**DESIGN FOR A NATIONAL URBAN TRANSPORTATION REPORTING SYSTEM**

The report analyzes the contents and uses of a National Urban Transportation Reporting System. The study was performed to assist UMTA in the implementation of Section 15 of the National Mass Transportation Act of 1974. A review of the PennDOT transit reporting system, its implementation and results are presented. A recommended set of data items and indicators is defined and analyzed. Another section of the report contains detailed information on a subgroup of the data items and indicators felt to provide a minimal yet comprehensive base for comparison of transit agencies.  
(PC A05/MF A01)

Vuchic, VR  
Pennsylvania University, Philadelphia, Urban Mass Transportation Administration Final Rpt UMTA-PA-11-0002-76-1, 1976, 90 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-259002/4ST, DOTL NTIS

17 145590

**MISSOURI PACIFIC'S COMPUTERIZED FREIGHT CAR SCHEDULING SYSTEM. STATE OF THE ART SURVEY: A COOPERATIVE EFFORT OF PRIVATE INDUSTRY AND GOVERNMENT**

The report describes the essential features of the service reliability and equipment utilization programs used by six major railroads. The survey was conducted for the development and demonstration of a computerized car scheduling system. The most important insights gained from the survey are: the railroad has made considerable progress in the development and use of service reliability and equipment utilization programs; the need for a computerized car scheduling system is widely recognized but its capabilities are not well understood, the principal factors that now exist and unless countered will retard the implementation of car scheduling on other roads are the provincialism of the railroads, the skepticism regarding practicality and the value of car scheduling, the variations of the capabilities of the prerequisite computer support systems, the lack of data standardization and data exchange; and an industry action program supported by FRA and specifically addressed to the problems of transferability is needed before car scheduling will be rapidly accepted by other railroads.

Shamberger, RC Sines, GS Dingle, AD  
Missouri Pacific Railroad, Federal Railroad Administration  
FRA/OPPD-76-5, Apr. 1976, 291 pp

Contract DOT-FR-65139

ACKNOWLEDGMENT: NTIS  
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PB-258346/6ST, DOTL NTIS

17 145602

**CARLOAD WAYBILL STATISTICS BASED ON A SAMPLE OF WAYBILLS FOR TERMINATIONS IN THE YEAR 1975. TERRITORIAL DISTRIBUTION TRAFFIC AND REVENUE BY COMMODITY CLASSES**

The statistics of this report have been compiled from a sample of audited revenue waybills submitted to the FRA by 75 railroads. The data regarding territorial distribution of railroad carload terminations have been compiled since 1972 utilizing a computer-based waybill information processing system (WIPS) developed under the direction of the Federal Railroad Administration. The statistics tabulated for 1975 were derived from a total of 131,074 waybills, 41,251 EM-5 documents and 1,150 multiple car statement documents resulting in 192,633 carloads.

Federal Railroad Administration 6780.1, Sept. 1976, 214 pp

ACKNOWLEDGMENT: NTIS  
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PB-258460/5ST, DOTL NTIS

17 147681

## THE THREE STAGES OF COMPUTER GROWTH

Data processing continues to grow. Initially it involved highly repetitive operations where decisions could be handled mechanically. The second stage involved improved utilization of assets--men, money, machines and materials. The third stage is EDP for planning and control as in project development and classification yard operation. Some of the problems with implementing advanced computer techniques and the methods of utilizing their outputs are discussed.

Champion, RM, Jr (Santa-Fe Railway) *Progressive Railroading* Vol. 19 No. 12, Dec. 1976, p 25

ACKNOWLEDGMENT: Progressive Railroading  
ORDER FROM: Murphy-Richter Publishing Company 20 North Wacker Drive, Chicago, Illinois, 60606

DOTL JC

17 148261

## RAPID TRANSIT SYSTEM DESIGN FOR HIGHER PRODUCTIVITY

The paper discusses ways to increase labor productivity and reduce labor costs. Centralized computer aided monitoring and control systems for trains, passengers, fare collection, electrification equipment, auxiliary equipment, security, yards, maintenance and management information should be provided. Also capability of running trains without operators and operating stations without agents are important. Some of the systems to improve productivity used on the Sao Paulo, Brazil metro or planned are also described.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Kalra, PS (Bechtel Corporation); Nakagawa, T  
American Society of Mechanical Engineers Conf Paper Paper D&O-24, 1976, 5 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

17 148270

## USE OF SIMULATION AND OPTIMIZATION IN THE DESIGN OF RAIL TRANSPORTATION SYSTEMS

Object functions are defined as some combinations of the system performance parameters for the purpose of optimization of the design and operation of rail transportation systems. The system performance parameters are computed using numerical simulation. A mathematical model of the system is developed, and a computer program is written to perform the simulation. The primary objective is the reduction of travel time and energy consumption. The method provides a quantitative way of comparing alternative designs, and proposed changes in the design or mode of operation of existing systems, in order to identify the optimum alternative.

Presented at an ASME Meeting, September 26-29, 1976.

Fenton, RG (Toronto University, Canada); Steiner, ML  
American Society of Mechanical Engineers Paper 76-DET-87, 1976, 7 pp, 11 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

18 130247

**RAILROAD CARGO TARIFFS AND A METHOD FOR ESTABLISHING THEM [Zheleznodorozhnye gruzovye tarify i metodika ikh postroeniia]**

This book presents methodical principles for a new system of tariffs for the transfer of freight by carloads, in containerized and less-than-carload shipments on a two-rate basis for origin-destination and line-haul operations. It gives the fundamental directions for further improvement of the system of transport tariffs, shows the initial base for reworking tariffs, and includes the definition and analysis of tariff rates, cost, stock capacity, and profit potential of transportation according to type of cargoes, forms of dispatching, and kinds of rolling stock. Examined in detail are problems of the formulation of tariffs according to separate, most important cargo complexes, and reflected are the systematical receptions of planning tariffs on the transportation of perishable cargoes in refrigerated trains and sections. The book also looks at problems of the automation of planning tariffs with the utilization of the electronic computer. The chapters are: (1) Theoretical principles of planned price formation and their application in the further improvement of railroad freight transport; (2) General results of the revision of railroad cargo tariffs and initial base taken during the reworking; (3) Reworking tariffs on the transportation of cargoes by means of carload shippers (except for perishables) in containers and small lots; (4) Reworking tariffs on the transportation of perishable cargoes; finally; (5) The utilization of the electronic computer during the reworking of tariffs. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

All-Union Labor Red Banner Railway Research Inst 1975, 80 pp, 1 Fig., 27 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

18 133198

**MULTI-REGIONAL INPUT-OUTPUT BASIC DATA TAPE, DOTR5**

The tape (DOTR5) consists of 3 files. The first file contains the 1963 state tonnage trade flows, the second file contains the sum of the 1963 state tonnage trade flows; and the third file contains the 1963 commodity prices. Specific information on the data assembly of the interregional shipments is available in a volume by John M. Rodgers, State Estimates of Interregional Commodity Trade, 1963 (Lexington, Mass.: Lexington Books, D.C. Heath and Co., 1973).

Source tape is in BCD character set. Tape can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions.

Polenske, KR

Department of Transportation Data File DOT/DF-76/001, DOT/DF-76/001, 1963

ACKNOWLEDGMENT: NTIS

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PB-251369/5ST, DOTL NTIS

18 133221

**ECONOMICS OF PUBLIC TRANSIT OPERATION**

The report examines the modeling of rapid rail and bus transit operating costs for the purpose of predicting these costs for use in benefit-cost analyses. Underlying parameters affecting cost are examined, including labor productivity in various categories, as measured by simple indices. Modeling techniques utilized include regression and unit cost.

Roess, RP Huss, MF Kwickliss, CS Camoia, R

Polytechnic Institute of New York, (UMTA-NY-11-0009) Proj. Rpt. UMTA-NY-11-0009-75-1, 52 pp

ACKNOWLEDGMENT: NTIS

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PB-251560/9ST, DOTL NTIS

18 133321

**OPERATING COSTS OF RAIL RAPID TRANSIT**

The report examines the cost of operation of rail rapid transit systems, and the prediction of such costs for future systems, based on data obtained from

the urban rail rapid transit operators in the United States and Canada. Existing cost-prediction models, based on the division of operating costs into maintenance of way and structures, maintenance of equipment, power, conducting transportation, administrative expenses, and miscellaneous expenses, are updated according to the most recent data available. In addition, those transit systems for which information is available are examined for division of costs into non-labor, direct labor and indirect labor categories; for the degree of utilization of personnel and facilities; for the relation of unit costs in the six categories to system characteristics; and for their relative scales of wages and benefits.

Kwickliss, CS Roess, RP

Polytechnic Institute of New York, Urban Mass Transportation Administration, (UMTA-NY-11-0009) Proj. Rpt. UMTA-NY-11-0009-74-2, May 1974, 64 pp

ACKNOWLEDGMENT: NTIS

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PB-251970/0ST, DOTL NTIS

18 133322

**AN ECONOMIC ANALYSIS OF UPGRADING RAIL BRANCH LINES: A STUDY OF 71 LINES IN IOWA**

The report summarizes results of research conducted to determine the economic benefits and costs of upgrading 71 rail lines in Iowa and to estimate the impact of abandonment of these rail lines upon communities and individual businesses in the state. A benefit-cost ratio was estimated for each line. Benefits to shippers and receivers were defined as the change in the annual net revenue from shipping the projected 1980 volume of grain, plus the change in costs for handling and transporting the projected 1980 volume of all other products if the line were upgraded rather than abandoned. The effect of railroad abandonment upon communities, elevators, and businesses that had lost their rail lines prior to 1970 was measured. In addition, the impact of rail abandonment on highways, safety, and fuel consumption was estimated.

Prepared by Iowa State Univ. of Science and Technology, Ames.

Baumel, CP Miller, JJ Drinka, TP

Iowa Department of Transportation, Iowa State University, Ames, Federal Railroad Administration Final Rpt. FRA/OPPD-76-3, Mar. 1976, 577 pp

Contract DOT-FR-55045

ACKNOWLEDGMENT: NTIS

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PB-251978/AS, DOTL NTIS

18 138065

**RATES AND COST OF GRAIN TRANSPORTATION BY RAILROAD**

No Abstract.

Davies, GK

Washington State University PhD Thesis 1972, 209 pp, Refs.

ACKNOWLEDGMENT: Northwestern University, Evanston

ORDER FROM: University Microfilms International 300 North Zeeb Road, Ann Arbor, Michigan, 48106

18 138067

**INTERSTATE COMMERCE COMMISSION, UNIFORM SYSTEM OF ACCOUNTS: RAILROAD COMPANIES**

No Abstract.

Interstate Commerce Commission IC 1 STE 44:973, 1973, 120 pp

ACKNOWLEDGMENT: Government Printing Office

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

S/N 026-000-00955-3

18 138074

**PROBLEMS OF METHODOLOGY FOR DETERMINING THE EFFICIENCY OF A NEW TYPE OF EQUIPMENT [Metodicheskie voprosy opredeleniya effektivnosti novoj tehniki]**

The article gives recommendations and the deduction for the formula determining the economic effect of the introduction of a new type of

equipment at present-day prices. The more accurate formula proposed by the authors of the article eliminates the distortions inherent in the old method, which made no provision for renewal. [Russian]

Vol'fson, AL Hait, EI *Vestnik Vniizt* Vol. 24 N 1975, pp 1-5, 1 Tab., 4 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Vestnik Vniizt 3-aya Mytishchinskaya ul. 10, Moscow, USSR

18 139467

**CONSTRUCTION OF COACHES AND WAGONS WITH A VIEW TO MINIMUM MAINTENANCE COSTS [Instandhaltungsgerechte Konstruktion von Reisezug und Guterwagen]**

The author observes that routine and unscheduled maintenance costs for the whole service lifetime of coaches and wagons amount to 200% of the purchase price. He examines the relationship between the construction of these vehicles and their maintenance costs. [German]

Drossel, P *Schienenfahrzeuge* Vol. 20 No. 2, Feb. 1976, pp 41-44, 4 Fig., 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: VEB Verlag fuer Verkehrswesen Franzoesische Strasse 13-14, 108 Berlin, East Germany

18 139643

**PREDICTING TRANSPORTER'S CHOICE OF MODE**

Every investment decision for transportation projects requires an extensive examination of the amount of anticipated traffic. A statistical technique, discriminant analysis, was used to determine its feasibility and applicability in estimating future traffic. Discriminant analysis is a method to statistically weigh transportation characteristics. This paper discusses an application of discriminant analysis in which travel demand is divided between transportation modes on the Ohio River. This study uses time of transit, distance of transit, annual tonnage, average shipment size, transportation rate, and handling charges as mode characteristics. An increase in the transportation rate, the most significant characteristic influencing mode choice by the user, was simulated (everything else held constant) so that a demand curve for barge transportation could be constructed.

Prepared for the 54th Annual Meeting of the Transportation Research Board.

Sasaki, BR (U.S. Office of Management and Budget) *Transportation Research Record* Conf. Rpt. No. 577, 1976, pp 13-18, 2 Fig., 2 Tab., 12 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

18 142274

**DISCOUNTED CASH FLOW ANALYSIS TO SELECT EQUIPMENT**

Recent interest in cost effectiveness has led to greater consideration of total overall (capital and operating) costs of equipment. A discounted cash flow analysis (DCFA) method is developed to compare total overall costs of competing equipment. An example using the technique for surface aerators in a municipal treatment plant is presented. The results show that small differences in operating efficiency are highly significant for equipment with high operation cost compared to initial cost. A sensitivity analysis is performed for the example to show the most significant variables. The general use of the DCFA method and sensitivity analysis to similarly structured problems is exemplified. Practical suggestions are given for specification writing for competitive bidding using DCFA. Considerable savings can be realized using this technique to select equipment.

Briller, R *ASCE Journal of the Environmental Engineering Div* Vol. 102 No. EE3, June 1976, pp 595-611

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

18 142941

**ESTIMATING MISALLOCATION OF TRAFFIC BETWEEN RAIL AND TRUCK TRANSPORT**

Properties of "least cost" studies as methods of estimating the extent and penalties of misallocation of traffic are evaluated. A probabilistic model of traffic allocation is developed to reflect evidence that rail and truck full costs for a given distance vary considerably for individual shipments. The "least cost" method is described and its assumptions explained. The probabilistic market share model is used to demonstrate that "least cost" methodology is biased as an estimator of traffic misallocation and social losses. Evidence about the average rail cost advantage is presented. A new approach based on the probabilistic market share model is described.

Presented at the Seventeenth Annual Meeting of the Transportation Research Forum, Beyond the Bicentennial: The Transportation Challenge, held in Boston, Massachusetts, October 28-30, 1976.

Altonji, JC (Charles River Associates, Incorporated)  
Cross (Richard B) Company Proceeding 1976, pp 379-87

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

18 143210

**FINANCIAL ANALYSIS OF THE NORTHEAST CORRIDOR DEVELOPMENT PROJECT. VOLUME I-MAIN REPORT**

A high speed passenger rail service between Washington, D.C., and Boston was called for in the Regional Rail Reorganization Act of 1973. Planning for the service has been conducted by the Office of Northeast Corridor Development in the Federal Railroad Administration. Engineering studies were undertaken to develop detailed plans and costs for the required facilities improvements. This report described the development of financial projections for the service. Operating unit costs were estimated. The operating cost estimates were combined with capital costs based on the engineering studies, and with proposed organizational and funding arrangements to develop financial projections. A computer model was developed to produce pro forma cash flow statements, income statements, and balance sheets for future years. Several organization and funding arrangements were tested. The results were measured in net present value and return on investment.

See also Volume 2, PB-256442.

Baker, HS Laughlin, MO  
Peat, Marwick, Mitchell and Company, Transportation Systems Center, Office of High Speed Ground Transportation Final Rpt., DOT-TSC-FR FRA/NECPO-76/10, FRA/NECPO-76/10, n, Nov. 1975, 169 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS

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PB-256441/7ST, DOTL NTIS

18 143211

**FINANCIAL ANALYSIS OF THE NORTHEAST CORRIDOR DEVELOPMENT PROJECT. VOLUME II-APPENDICES**

This appendix consists of two parts. The first part, Program Capability, contains a description of the capability of the program and is intended to bridge the gap between the descriptive material contained in Appendix D and the explanation of procedure which follows. It should be read before preparing new input data. The second part, Procedure, contains a portion of the computer program itself which describes the procedure for using the program. It should be referred to when the user is prepared to provide new input data to the program. Portions of this document are not fully legible.

See also Volume 1, PB-256441.

Baker, HS Laughlin, MO  
Peat, Marwick, Mitchell and Company, Transportation Systems Center, Office of High Speed Ground Transportation Final Rpt. FRA/NECOP-76/11, Nov. 1975, 181 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS

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PB-256442/5ST, DOTL NTIS

18 144089

**FREIGHT CAR TRUCK DESIGN OPTIMIZATION. ECONOMIC ANALYSIS REPORT--PHASE I**

This report summarizes the truck economic research accomplished during Phase I of the Federal Railroad Administration's three-phase Truck Design Optimization Project (TDOP). In this phase: A truck economic methodology was developed with the cooperation of representatives from the railroad industry and their suppliers. The methodology is for industry use to help establish the cost performance of the individual railroads' existing trucks and evaluate investments in proposed truck improvements. The economic data elements were identified and procedures were developed at various levels of specification to collect the information. An overall truck cost information system was designed. The system will provide a user with the processing capability to establish the integrated truck economic data base and present the data for evaluation. Economic data analysis guidelines was developed to establish and evaluate the cash flows of investments in proposed improvements to existing trucks. The approach to evaluating the operating cost performance of existing trucks through the exploitation of the economic data base was developed. The report recommends that the railroad industry adapt the TDOP methodology developed thus far to their individual company environments and begin to establish working procedures for the economic selection of existing trucks and proposed improved truck designs. Suggested further economic research is also identified.

See also: FRA-OR&D-75-58, April 1975 (NTIS Accession Number PB-248832) Methodology for a Comprehensive Study of Truck Economics, and FRA-OR&D-75-58A, February 1976 (NTIS Accession Number PB-251400) Truck Economic Data Collection and Analysis.

Southern Pacific Transportation Company, (TDOP 76-3) Tech. Rpt. FRA/ORD-76/287.I, July 1976, 6 pp, 1 Fig., 6 Tab., 2 App.

Contract DOT-FR-40023

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

18 147700

**PROFIT MANAGEMENT SYSTEMS: KEY TO STRONGER RAILROADS**

The cost accounting system described determines costs in transportation and other activities and not in financial and accounting records. The author explains that the basis for profit management is cost accounting and it is now possible to determine costs and profit of railroad functions.

Christ, EC

Simmons-Boardman Publishing Corporation 1976

ORDER FROM: Simmons-Boardman Publishing Corporation 508 Birch Street, Bristol, Connecticut, 06010

DOTL JC

18 147819

**THE DATE OF DISCOUNTING IN COST-BENEFIT STUDIES**

Dates of discounting are important because the discounted benefits often have to be weighed against amenity. Conversion to annual values may be helpful.

Layard, PRG Walters, AA *Journal of Transport Economics and Policy* Vol. 10 No. 3, Sept. 1976, pp 263-266

ACKNOWLEDGMENT: British Railways

ORDER FROM: London School of Economics and Political Science Houghton Street, Aldwych, London WC2A 2AE, England

DOTL JC

18 148256

**DEVELOPMENT OF MULTI-MODAL COST ALLOCATION MODELS**

Readily available operating and financial data for public transportation systems in Chicago urban area were used to construct multivariable cost allocation models for each of the region's eight commuter railroads and 10 major bus systems. A cost allocation model was also derived for the rapid transit operations of the Chicago Transit Authority. The cost allocation model is developed by assigning individual expense accounts to one of five transit system resources--vehicle (car) miles, vehicle hours, peak vehicle (car) needs, track miles and passenger revenue. By dividing the total cost allocated to each resource by the appropriate operating statistic, unit costs are computed for each resource. These unit costs represent the coefficients of the cost allocation model, which is then used to analyze the economics of the various transportation modes.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Cherwony, W (Simpson and Curtin Incorporated); McCollom, B  
American Society of Mechanical Engineers Conf Paper Paper P7P-1, 1976, 9 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

19 134533

**THE GOLDEN AGE OF THE EUROPEAN RAILWAYS 1850-1900**

[L'age d'or du rail europeen (1850-1900)]

As a continuation of "The birth of the European railways (1800-1850)", "The golden age" recalls the stirring era of major railway construction, giving a vivid picture, throughout the world, of civilisation during the second half of the 19th century when the railway advanced in all directions "from the centre of towns and to the top of mountains" and thus wrought fundamental changes everywhere because of the revolutionary nature of civil engineering work, as well as the advanced design of rolling stock. The "Gay Nineties" come to life again with their "charabancs", luxurious royal trains, excursion trains, the "flyers", and even railway disasters. Closely associated with everyday life, the railway reigned supreme... and, unfortunately, also began to play its part in war. [French]

Pecheux, J

Editions Berger-Levrault 1975, 256 pp, Figs., Tabs.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Editions Berger-Levrault Paris, France

19 142926

**THE STORY OF AMERICA'S TRANSPORTATION REVOLUTION**

During the 200 years since the Declaration of Independence, the United States witnessed a revolution in transportation unprecedented in recorded history. For hundreds of years, man had achieved no significant advances in his methods of transportation. Then, with the dawn of the 19th century, began a succession of major transportation innovations in Britain, the United States and other countries--the turnpike, the barge canal, the steamboat, the railroad locomotive, the automobile, and finally the airplane. These new modes permitted the movement of more and more goods and

people over longer and longer distances, faster and faster, and at lower and lower costs. Thus, they made possible local and regional specialization in agriculture and manufacturing; the development of mass markets; the birth of large-scale manufacturing; the congregation of vast numbers of people in towns and cities.

Dallaire, EE *ASCE Civil Engineering* July 1976, pp 70-74

ACKNOWLEDGMENT: ASCE

ORDER FROM: ESL

DOTL JC

19 145165

**RAILROAD MAPS OF THE UNITED STATES**

This annotated list reveals the scope of the railroad map collection of the Library of Congress and highlights the development of railroad mapping in 19th Century America. Described are 622 maps chosen from more than 3,000 railroad maps and almost 2,000 regional, state, and county maps. The maps vary widely in area, content, and scale, some depicting the inter-relationships of various modes of transportation, others showing land immediately adjacent to a specific railroad right of way. All of the maps selected represent a profile of the development of cartographical style and technique and are not intended to inventory all maps in the division that show railroads. The list does reflect, however, the important achievements of early railroaders toward reaching their ultimate goal of providing a transportation network spanning the country and linking the Atlantic and Pacific Oceans.

Library of Congress LC 5.2:R 13, 1975, 112 pp

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO-030-004-00014-1

20 133199

**MULTI-REGIONAL INPUT-OUTPUT BASIC DATA TAPE, DOTR6**  
The tape consists of 4 files. The first file contains the projected 1970 state tonnage trade flows; the second file contains the sum of the projected 1970 state tonnage trade flows, the third file contains the projected 1980 state tonnage trade flows; and the fourth file contains the sum of the projected 1980 state tonnage trade flows. Specific information on the assembly of 1963 trade data upon which these projections are based is contained in a book by John M. Rodgers, 'State Estimates of Interregional Commodity Trade, 1963', (Lexington, Mass.: Lexington Books, D.C. Heath and Co., 1973). Information on the method of making the projections is contained in a report by Karen R. Polenske, Caroline W. Anderson, and Mary M. Shirley, 'A Guide for Users of the U.S. Multiregional Input-Output Model' (DOT Report No. 2, Prepared for the Office of Systems Analysis and Information, U.S. Department of Transportation, September 1973, revised--NTIS No. PB-242558.)

Source tape is in BCD character set. Tape can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Documentation available as PB-242558.

Polenske, KR

Department of Transportation Data File DOT/DF-76/002, 1974

ACKNOWLEDGMENT: NTIS

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20 137201

**THE SUPPLY OF COAL IN THE LONG RUN: THE CASE OF EASTERN DEEP COAL**

This report develops a methodology for estimating long-run supply curves for coal. The method relies on engineering information and geological data and is applied to deep mining in the Eastern United States. Cost functions are estimated combining engineering and econometric procedures. Information on the geology of coal deposits is used in conjunction with the cost functions to estimate how costs will behave over time as output cumulates. The procedure is applied separately to low sulfur and high sulfur coal.

Zimmerman, MB

Massachusetts Institute of Technology, National Science Foundation NSF/RA/N-75-269, Sept. 1975, 87 pp

Grant NSF-SIA73-07871-A02

ACKNOWLEDGMENT: NTIS

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PB-252642/4ST, DOTL NTIS

20 137235

**U.S. COAL RESOURCES AND RESERVES**

This report is made up of three sections: The first defines the different categories of coal resources and provides estimates of the extent of each. The second discusses the sulfur content of coal in relation to environmental standards, and the third presents data on coal reserves on Federal and Indian lands, where a major portion of the Nation's reserves are located.

Parker, NA Thompson, BC

Federal Energy Administration FEA/B-76/210, May 1976, 16 pp

ACKNOWLEDGMENT: NTIS

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PB-252752/1ST, DOTL NTIS

20 138077

**HISTORICAL FUELS AND ENERGY CONSUMPTION DATA 1960-72, UNITED STATES BY STATES AND CENSUS DISTRICTS EAST OF THE MISSISSIPPI**

Salient historical data on consumption of fuels and energy have been summarized by State and census district for the years 1960 through 1972. This Information Circular covers States east of the Mississippi, and Information Circular 8705 covers States west of the Mississippi. These data studies are planned using the same Btu conversion factors consumption statistics by States and districts. Future studies are planned using the same Btu conversion factors applied in these two Information Circulars.

196

Crump, LH

Bureau of Mines 1976, 456 pp

ACKNOWLEDGMENT: Bureau of Mines

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

I28.27:8704, 024-004-01833-0

20 138078

**U.S. COAL AND THE ELECTRIC POWER INDUSTRY**

The author examines current theories of coal economics and draws on extensive discussions with both coal consumers in the electric power industry and with the coal industry itself. He finds that the future of coal is by no means as promising as speculators suggest, and that coal reserves may not be as accessible as previously assumed. Today's more expensive oil can still compete successfully with coal in meeting environmental standards, and nuclear power may be a strong competitor. Thus, while the study emphasizes the value of continuing research on coal and coal-derived fuels, it gives no promise that coal will become a fuel of first resort in the American electric power industry. Gordon provides tabular demonstration of the complex relationships he describes among fuels, power companies, purchasing policies, cost, and environmental policies, all of which influence the use of coal as an energy-generating fuel.

Gordon, RL

Johns Hopkins Press ISBN 0-8018-1697-1, 1975, 213 pp

ACKNOWLEDGMENT: ASME Journal of Mechanical Engineering

ORDER FROM: Johns Hopkins Press Homewood Campus, Baltimore, Maryland, 21218

20 139520

**FEDERAL ENERGY ADMINISTRATION PROJECT INDEPENDENCE BLUEPRINT FINAL TASK FORCE REPORT ON TRANSPORTATION, VOL. 1: ANALYSES OF REQUIREMENTS AND CONSTRAINTS ON THE TRANSPORTATION OF ENERGY MATERIALS, VOL. 2: INPUTS TO THE PROJECT INDEPENDENCE EVALUATION SYSTEM INTEGRATION MODEL FOR THE TRANSPORT OF ENERGY MATERIALS**

The object of the Crosscut Studies of the Transport of Energy Materials is to determine the degree in which the transportation system will be able to accommodate the goals of Project Independence, the degree in which transportation may be a constraint on the attainment of those goals and the effectiveness of various government policies in lifting any constraints. Transport modes studied were rail, waterway, oil and gas pipeline, coal slurry pipeline, truck movement of coal. The first volume of two analyzes the various transport modes in terms of regional and nation-wide capacities and suggest policy options. Volume Two serves two purposes: to present the methodology used to develop the data input to the Project Independence Supply and Demand Balancing Model and to document those inputs.

Federal Energy Administration Nov. 1974

ACKNOWLEDGMENT: EI

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

n.4118-00025, n.4118-00030

20 141122

**CIGGT TRANSPORTATION DATA BASE DESCRIPTION AND USAGE**

A transportation data base, established by CIGGT to provide a comparative multi-modal, multi-commodity structure, is described. The data base contains annual commodity flow data for Rail, Truck and Vessel, beginning in 1970. The system supporting this data base is detailed. This system includes programs to edit raw data, integrate it into the data base, and, using a general retrieval program (written in MARK IV), to perform selective retrievals. The structures of all files, codes and retrieval techniques are presented in sufficient detail to permit a potential user to structure his request in a form compatible with the data base system.

One of a series of three companion reports resulting from the Canadian Freight Transport Model project. The other two are: No. 75-11, "The Railcar Network Model," E.R. Petersen, H.V. Fullerton, et al, June 1975; No. 75-14, "Freight Mode Selection in Canada," Ronald E. Turner, October, 1975.



Graham, LJ  
 Canadian Institute of Guided Ground Transport, (CIGGT Project N. 5.1)  
 R&D Rept. CIGGT Rept. N. 75-12, July 1975, 84 pp, 3 Fig., Tabs., 1 Ref.,  
 11 App.

ACKNOWLEDGMENT: CIGGT  
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**20 141123**

**FREIGHT MODE SELECTION IN CANADA**

In recognition of the importance of freight transportation in Canada, this study investigates the process whereby the selection of a transportation mode occurs. The three principal modes forming the basis of the study are Rail, Truck and Ship. The point of departure for the study is the supposition that certain functional attributes of the three modes collectively determine which mode is chosen in particular situations. A data bank consisting of records of individual shipments of various commodities during 1970 is described. The following attribute measures, identified by commodity, mode and origin-destination, are employed: tonnage per shipment, tariff, distance, transit time, unreliability, time variation, density and unit value. Formal statistical models are developed for relating the selection of a mode to the degree to which its shipments possess the attributes. The results of the statistical analyses are evaluated within the context of a procedure by which the management of a particular freight carrier might wish to determine the most appropriate settings of his service variables. Inferences are drawn about the relative importance of the various mode attributes in relation to modal share. The analysis reveals considerable diversity between commodities as to which attributes are important. This justifies the detailed analysis of individual shipments, which is made possible by the unique data bank employed in the study. Some generalizations are possible, however. Tariff is usually an important attribute and it exhibits the expected inverse relationship with modal share. Transit time and time variation are important for some, but not all, commodities. Distance and weight per shipment are also strongly associated with mode selection.

This is one of a series of three companion reports resulting from the Canadian Freight Transport Model project. The other two are: No. 75-11 "The Railcar Network Model," E.R. Petersen, H.V. Fullerton, et al, June 1975, and No. 75-12 "CIGGT Transportation Data Base-Description and Usage," L.J. Graham, July 1975.

Turner, RE  
 Canadian Institute of Guided Ground Transport, (CIGGT Project N. 5.1)  
 R&D Rept. CIGGT Rept. N. 75-14, Oct. 1975, 93 pp, 1 Fig., 64 Tab., 54 Ref., 1 App.

ACKNOWLEDGMENT: CIGGT  
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**20 141430**

**EFFECTS OF THE PROPOSED NORTHEAST-MIDWEST RAIL REORGANIZATION ON RURAL AREAS**

This is a report on the study undertaken to evaluate the impacts on agriculture and rural development likely to result from rail service changes resulting from the Regional Rail Reorganization Act of 1973. The study primarily examines potential impacts on established firms using rail service at 100 rural rail stations, each of which is on line failing to meet standardized tests of financial viability. The study shows abandonment impacts are likely to affect established agribusiness and nonagricultural industries somewhat differently. Farmers and consumers are not considered likely to suffer overall adverse effects. There is also a case study of two recent abandonments in Midwest farming areas with effects of abandonment difficult to generalize.

Prepared in cooperation with Agricultural Marketing Service, USDA and the FRA, DOT, for the U.S. Senate Committee on Agriculture and Forestry hearing, March 24, 1975.

Department of Agriculture Cong. Rpt. 1975, 74 pp, 3 Fig., 17 Tab., 31 Ref., 3 App.

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO-47684, DOTL HE2705.E34

**20 141434**

**COMPREHENSIVE AREAWIDE CONSOLIDATION AND RELOCATION STUDY-- ST. LOUIS REGION. VOLUME 2-FREIGHT AND MODE-SHARE ANALYSIS**

This report on "Freight Generation and Mode-Share Analysis" for the Comprehensive Area-wide Railroad Consolidation and Relocation Study-St. Louis Region evaluates the rail share of future freight traffic volume that might be anticipated for the St. Louis Region. The purpose of the report is to develop forecasts of future rail freight volumes that are classified as "overhead" or "through" freight and those that either originate or terminate in the St. Louis Region and are referred to as "local" freight. The assumptions and methodology used to obtain the forecasts are discussed along with the application of the Multi-Regional Input-Output Model (MIRO). The forecasts are used as input to the AAR Network Simulation Model and, in addition, the local freight forecasts are used in conjunction with projects of future industrial locations patterns within the region to develop a freight generation map. Industrial locations patterns are obtained from the DYLAM II Model which allocates future growth in land uses based on the supply of sites meeting specific physical and environmental criteria.

See also V1, RRIS 24 141433; V3, 20 141435; V4, 15 141436; V5, 25 141437; V6, 15 141438. Co-authors of this report are Parsons, Brinckerhoff, Grotz and Eric Hill.

East-West Gateway Coordinating Council Final Rpt. Vol. 2  
 EWG-PB-0268.10.0, June 1974

Contract DOT-FR-20023

ACKNOWLEDGMENT: FRA  
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**20 141450**

**MINERALS IN THE U.S. ECONOMY: TEN-YEAR SUPPLY-DEMAND PROFILES FOR MINERAL AND FUEL COMMODITIES (1965-1974)**

The Bureau of Mines has prepared supply-demand flow diagrams and 10-year tables for mineral and fuel commodities that present essential data required by government, industry, and others to formulate policies and programs that can help assure an adequate and continuing supply of mineral raw materials. The 10-year data base terminates with 1974 figures because adequate world information was not available beyond that data. The selected mineral supply-demand tables and flow diagrams comprise but one "output" from the massive body of information and data collected and compiled by the Bureau of Mines on a continuing basis covering mineral production, consumption, prices, shipments, imports, exports, and stocks, as well as industry activities in all states and abroad.

Bureau of Mines Publications Distribution Branch SP 7-76, 1976, 99 pp, 93 Fig.

ACKNOWLEDGMENT: Bureau of Mines Publications Distribution Branch  
 ORDER FROM: Bureau of Mines Publications Distribution Branch 4800 Forbes Avenue, Pittsburgh, Pennsylvania, 15213

**20 141451**

**WORLD DISTRIBUTION AND FLOW OF MAJOR MINERAL COMMODITIES**

World mineral production is closely related to world steel production. World steel production for the past 25 years is graphed for five major areas: the United States, the Common Market, Japan, the U.S.S.R., and the rest of the world. Detailed tables compare the following major countries and land areas: area; population; iron ore and raw steel production, scrap and steel consumption; bauxite, alumina, and aluminum production/aluminum consumption; tin mine and smelter production and consumption; copper mine, smelter, and refinery production and consumption; crude oil and coal production and consumption. The role of minerals, including scrap, in the U.S. economy is assessed in detail.

A presentation of the U.S. Bureau of Mines at a meeting held in Washington, D.C., in 1976.

Morgan, JD, Jr  
 Bureau of Mines Conf Paper PR-2-76, Apr. 1976, 18 pp, 9 Fig.

ACKNOWLEDGMENT: Bureau of Mines, NTIS

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PB-255963/AS, DOTL NTIS

20 141575

**INVESTMENT BARRIERS FOR SMALL AND MODERATE SHIPPERS FROM LOCATING ON RAIL: A NEED TO ADJUST NATIONAL POLICY**

There is at least circumstantial evidence that shippers are discouraged from locating on rail. Additional research is needed to define specific industries where this investment barrier is most significant. The effects of various changes in our current policy must be evaluated in terms of contribution to railroads' health and flow of public funds. The attention of policy makers must be diverted from long range debates on deregulation to more immediate solutions to rail problems. The author state that they should be examining more feasible alternatives such as those for encouraging more shippers to avail themselves of rail service. Various incentives are described.

Beier, FJ (Minnesota University, Minneapolis) *ICC Practitioners' Journal* Vol. 43 No. 6, Sept. 1976, pp 724-733, 4 Tab.

ORDER FROM: Association of Interstate Commerce Comm Pract 1112 ICC Building, Washington, D.C., 20423

DOTL JC

20 141638

**COMPETITION BETWEEN RAILROADS AND TRUCKS**

This analysis shows the correlations between modal share (tonnage) of the freight transport market and the independent variables of distance of haul and size of shipment, especially when total freight tonnage is used rather than individual commodities. Railroad maximum penetration of markets is significantly higher when shipment size is used as an independent variable, indicating that the railroad's greatest comparative advantage is in volume economics, although efficiency in long hauls is still important. Variations for some individual commodities indicate that rail rates sometimes do not relate directly enough to the cost advantages of railroad carriage or that shippers deliberately choose premium forms of transportation when more economical methods are available. Energy constraints lead to a larger rail share of the market.

Rakowski, JP (Minnesota University, Minneapolis) *Traffic Quarterly* Vol. 30 No. 2, Apr. 1976, pp 285-301, 6 Fig., 2 Tab.

ORDER FROM: ESL

20 142266

**IMPACT OF RISING ENERGY COSTS ON THE DOMESTIC PRODUCTION OF SELECTED COMMODITIES**

The analysis showed that of the five commodities studied, the copper industry would appear to be most sensitive to a dramatic rise in energy costs. Phosphates also would appear to be very cost sensitive to a rise in energy prices. It is believed that at least in the next decade these higher energy costs can be absorbed, particularly in view of the necessity of food and the results of inadequate world fertilizer supplies. Coal and the iron and steel industries would appear to be least affected by rising energy costs, provided such rises do not cause recessions or depressions with a decrease in demand. Oil shale, provided gases are recycled, would appear to be little affected costwise by a rise in energy price.

Haycocks, C (Virginia Polytechnic Institute & State University)  
Bureau of Mines May 1976, 124 pp, 26 Fig.

Grant G-0133086

ACKNOWLEDGMENT: Bureau of Mines  
ORDER FROM: NTIS

PB-256650/AS, DOTL NTIS

20 142269

**PROJECTS TO EXPAND FUEL SOURCES IN WESTERN STATES. SURVEY OF PLANNED OR PROPOSED COAL, OIL SHALE, TAR SAND, URANIUM, AND GEOTHERMAL SUPPLY EXPANSION PROJECTS, AND RELATED INFRASTRUCTURE, IN STATES WEST OF THE MISSISSIPPI RIVER (AS OF MAY 1976)**

This Bureau of Mines study is a listing of fuel-related projects that are presently under construction, planned, or proposed by various companies

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and organizations in the Western United States. The future facilities covered in this report fall into the following categories: coal mines and expansions to existing mines, electric powerplants and waste-to-fuel conversion plants, oil shale projects, tar sand projects, potential geothermal facilities, coal slurry pipelines, railroads related to fuels development, uranium mines and expansions to existing mines, uranium mills and enrichment facilities, oil refineries, and natural gas processing plants. The projects are listed by State. Data concerning the company, location, planned markets, process type, initial operating date, capacity, water requirements, employment, current status, and other relevant information are included. Each project has been plotted on an accompanying state map. Due to present uncertainties concerning the fuels industry, some of the listed projects may never be constructed. No attempt has been made to determine the degree of certainty or viability of each project.

Corsetino, JS  
Bureau of Mines 1976, 208 pp, 22 Fig.

ACKNOWLEDGMENT: Bureau of Mines

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO-024004018844

20 142291

**COAL CONVERSION: AN OVERVIEW OF STATUS AND POTENTIAL**

This paper summarizes the characteristics of principal coal conversion technologies and their potential for supply of energy in the form of "clean" liquids and gases. Coal conversion as used in the context of this presentation means the transformation of coal from its solid form to a liquid, gaseous, or low-ash solid product which will meet environmental standards. In the case of high-sulfur coal, the conversion process will reduce sulfur content of the product to a satisfactory level. These coal-derived products represent key candidates for future energy supply from indigenous resources; the achievement of the goal of development of a viable commercial industry has become a national objective.

Recorded in the Greater Los Angeles Area Energy Symposium Proceedings, April 3, 1975, and published in Volume 1, Los Angeles Council of Engineers and Scientists Proceedings Series.

O'Hara, JB (Parsons (Ralph M) Company)  
West Publishing Company Proceeding Vol. 1, 1975, pp 44-57, 7 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Los Angeles Council of Engineers and Scientists 1052 West 6th Street, Los Angeles, California, 90014

20 142500

**THE CONSEQUENTIAL EFFECTS ON ROAD/RAIL TRAFFIC TRANSFERS ON EUROPEAN TRADE BALANCES. GOODS TRANSPORT**

The paper discusses a survey conducted by the Arthur D. Little Research Institute amongst French industrial and commercial concerns where there was a choice of possible transport mode. The survey covered eleven key sectors of the economy having a major influence on the daily life of consumers. The study assumes that regulations prohibit the carriage of goods by road over distances greater than 150 km. A comparison of the estimated currency savings with losses resulting from the transfer of goods revealed a saving to loss ratio of less than 0.31. The mathematical analysis described in the paper using 1974 figures shows the negative effects on the foreign trade balance that would result from any compulsory transfer of goods from the road. Charts and tables are given in an appendix showing the breakdown of transport modes employed at various stages of the industries considered in the study. /TRRL/

International Road Transport Union Nov. 1975, 30 pp, 9 Fig., 9 Tab.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 221545)

ORDER FROM: Transport and Road Research Laboratory Centre Internationale 1, rue de Varembe, P.O. Box 44-1211, Geneva 20, Switzerland

20 142532

**COAL RESOURCES OF THE UNITED STATES, JANUARY 1, 1974**

This report discusses and analyzes total U.S. coal resources in the broad sense, including both identified and undiscovered resources. The coal

resources of the U.S. remaining in the ground on January 1, 1974, are estimated to total 3,968 billion tons. The new U.S. estimate is a 23-percent increase over previous estimates, made possible by an increased program of geologic mapping, exploration, and study during the past few years by Federal and State agencies and by private industry. The identified tonnage has been classified in all States according to rank. It has also been classified by thickness of overburden, degree of reliability of estimates, and thickness of beds in 21 States. Coal thus classified is well distributed in all coal provinces and presents about 60 percent of the total identified tonnage. This large classified tonnage is, therefore, reasonably representative of the total identified resources.

*United States Geological Survey Bulletin* No. 1412, 1975, 25 pp, Refs.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 20 142533

##### ENERGY REQUIREMENTS IN THE STEEL INDUSTRY

This paper examines fuel requirements for a variety of processing steps in steelmaking. Direct reduction, blast furnaces and basic oxygen furnaces (BOF's), and scrap melting in electric furnaces are considered for the primary production of steel. Continuous and ingot casting are considered together with finishing operations. Scrap iron and fuel requirements for different combinations of processing steps are given, and the effects of environmental regulations and capital requirements are also briefly considered.

Presented at the 11th National State-of-the-Art Symposium on Energy and Materials, Washington, D.C., June 9-11 1975.

Sigworth, GK (Inland Steel Research Laboratory); Corban, FL Robins, NA  
American Chemical Society Proceeding 1975, 24 pp, 48 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: American Chemical Society Publications 1155 Sixteenth Street, NW, Washington, D.C., 20036

#### 20 142540

##### PACER-DATA ENTRY, RETRIEVAL, AND UPDATE FOR THE NATIONAL COAL RESOURCES DATA SYSTEM (PHASE I)

PACER is a set of programs, written in FORTRAN IV, which extends the capability of GRASP and which has been developed in response to the need for a computer-based National Coal Resources Data System (NDRDS). PACER allows the user to enter data into one of three files, to search for and retrieve records using specific data elements, and to modify and update existing data records. All coal resource records west of the Mississippi River are ground into WCOAL, whereas those east of the river are grouped into ECOAL. Each data record in WCOAL and ECOAL reflects a unique tonnage estimate of coal resource in a predefined category of thickness, overburden, and reliability of estimate. The USALYT file contains published coal analytical data and is structured to be as compatible as possible with the coal-resource tonnage files; however, it is not yet separated into east and west. A detailed description of the files is accompanied by user documentation for the use of the data files. A programmer's reference is also included to facilitate the installation and use of this software system on other computers.

Cargill, SM Olson, AC Medlin, AL  
Geological Survey Prof. Pap. No. 978, 1976, 110 pp, 9 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 20 143657

##### NATIONAL CONSIDERATIONS OF STRATEGIC AND CRITICAL MATERIALS

The relationship of raw and processed mineral materials to the economy, and the role of exports, imports, and recycling are quantified. Import status for 36 major mineral imports is detailed. World steel production by major area for the past 25 years is graphed. Graphs of the mineral transportation relationship, plastics supply and demand and the synergistic effects of trace elements are included.

Presented at the National Symposium on Ceramics in the Service of Man, Carnegie Institution, Washington, D.C.

Morgan, JD, Jr  
Bureau of Mines BuMines-PR-5-76, June 1976, 20 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255965/6ST, DOTL NTIS

#### 20 143661

##### IMPLEMENTING COAL UTILIZATION PROVISIONS OF ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

This report reviews the status and current strategy of FEA's program for implementing the coal utilization provisions of the Energy Supply and Environmental Coordination Act of 1974 (ESECA) (P.L. 93-319) as amended by the Energy Policy and Conservation Act (EPCA) (P.L. 94-163).

See also report dated April 1975, PB-250104.

Federal Energy Administration FEA/G-76/193, Apr. 1976, 42 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255855/9ST, DOTL NTIS

#### 20 143664

##### AVAILABILITY OF CONVENTIONAL ENERGY RESOURCES MATERIALS- COAL

Tables and data are presented concerning coal reserves, production, beneficiation, and use in electric power generation.

Morgan, JD, Jr  
Bureau of Mines BuMines-PR-3-76, June 1976, 17 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255798/1ST, DOTL NTIS

#### 20 145169

##### OPERATIONS OF FOR-HIRE LIVESTOCK TRUCKING FIRMS

No Abstract.

Boles, PP  
Economic Research Service A1.107:342, 1976, 35 pp, Figs., Tabs., Refs.

ACKNOWLEDGMENT: Monthly Catalog of U.S. Government Publications  
ORDER FROM: Economic Research Service Department of Agriculture, Washington, D.C., 20250

#### 20 145177

##### CLIMATE AND FOOD: CLIMATIC FLUCTUATION AND U.S. AGRICULTURAL PRODUCTION

The degree to which present agricultural practice in the United States is vulnerable to unexpected variation in weather and climate, according to a report by a committee of the National Research Council, is cause for concern about the adequacy of future world food supplies. Agriculture is vulnerable to climate fluctuations not only because they are unforeseen but also because as yet they are unforeseeable. Reliable, long-range forecasting of weather and climate is not yet available, and present technology and management of agriculture are too inflexible to accommodate sudden, unfavorable departures from expected weather patterns. Long-term trends in climate are not as important to U.S. food production as are fluctuations or increased variability in climate over a season, a year, or several years. It is more difficult for agriculture to respond to short-term changes and increased variability than to gradual changes.

This report is by the Committee on Climate and Weather Fluctuations and Agricultural Production, Board on Agriculture and Renewable Resources; Commission on Natural Resources, National Research Council. Notification of publication appeared in NAS News Report, Vol. 27, No. 1.

National Academy of Sciences-Natl Research Council, (ISBN-0-309-02522-2) 1976, 221 pp

ORDER FROM: National Academy of Sciences-Natl Research Council 2101 Constitution Avenue, NW, Washington, D.C., 20418

#### 20 145178

##### RENEWABLE RESOURCES FOR INDUSTRIAL MATERIALS

As potential substitutes for nonrenewable resources in industrial applications, forest and agricultural products constitute in the United States a

"great and under-used national resource," a committee of the National Research Council found after assessing the role of renewable resources in plans to meet future materials needs. Before this potential can be realized, the committee said, the "technology for substitution" must be developed, environmental effects must be considered, and economic and social conditions must either permit or require it. "The materials available and potentially available from renewable resources can be used as alternatives to materials currently obtained from nonrenewable resources to augment national and world materials supplies, to improve energy conservation in materials supply and use, and to relieve dependence on foreign sources of energy and materials and accompanying balance of payment problems," the committee said. "The orderly and rational development of a national policy for the achievement of these objectives requires refinement of methods of evaluating alternative materials supply systems in terms of resource supply; available technology; and energy, manpower, and capital requirements."

This report is by the Committee on Renewable Resources for Industrial Materials, Board on Agriculture and Renewable Resources; Commission on Natural Resources, National Research Council. Notification of publication appeared in NAS News Report, Vol. 27, No. 1.

National Academy of Sciences-Natl Research Council, (ISBN-0-309-02528-1) 1976, 283 pp

ORDER FROM: National Academy of Sciences-Natl Research Council 2101 Constitution Avenue, NW, Washington, D.C., 20418

20 145738

**THE SPATIAL CHARACTERISTICS OF THREE WYOMING FUELS**

This paper examines the development patterns of Wyoming's petroleum, natural gas, and coal resources. The emphasis is on the location of the resources and their movements. The author suggests, through the use of a limited number of measurements, that the spatial characteristics of Wyoming fuels have displayed a mutable nature. It is posited that an examination of Wyoming's past experience might provide the state with a better understanding of the state's current position as a major fuel supplier. (Author)

Vuk, MM

United States Air Force Academy Final Rpt. USAFA-TR-76-15, June 1976, 60 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

AD-A030873/4ST, DOTL NTIS

20 145870

**STRIPPABLE COAL RESOURCES OF COLORADO. LOCATION, TONNAGE, AND CHARACTERISTICS OF COAL AND OVERBURDEN**

Coal resource data from public and private sources, in conjunction with previously published data, were used by the Bureau of Mines to determine the location and extent of strippable coal resources in Colorado. Total strippable resources of approximately 18 billion tons were estimated in 12 separate coal regions, fields, or deposits. Coal recoverable by contour mining techniques was not included. Criteria used in defining strippable resources were a minimum coalbed thickness of 2 feet and a maximum overburden thickness of 150 feet, except where the coalbeds are of exceptional thickness. All Colorado coal is contained in either Cretaceous or Tertiary rocks, specifically the Dakota Sandstone and the Mesaverde Group or its equivalent of Cretaceous age; and the Dawson Arkose, Fort Union, and Wasatch Formations and equivalents of Tertiary age. The strippable coal ranges in rank from bituminous in the Yampa region to ligniferous in the Denver basin. All coal is low in sulfur content.

Speltz, CN

Bureau of Mines BuMines-IC-8713, Aug. 1976, 78 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-257782/3ST, DOTL NTIS

20 145892

**THE ILLINOIS COAL DIGEST**

This report is the first in a series of coal reference manuals designed to serve as a benchmark reference work to data on the Illinois coal industry.

Time-series data are generated for over the most recent five year period where data were available. Individual sections are devoted to Illinois coal reserves, mining, transportation, distribution, consumption, and individual county profiles. Comparative data on other coal producing states have also been included, where applicable.

Weil, KS Grandys, AK

Illinois Department of Business and Economic Devel, National Science Foundation Final Rpt. NSF/IDOE-RS-76-06, Sept. 1976, 131 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-257623/9ST, DOTL NTIS

20 145900

**THE EFFECT OF UNCERTAINTY ON THE SUPPLY OF COAL**

This report discusses the effects of price uncertainty; technological uncertainty, as manifested through questions evolving from the probability of work stoppages and functional irregularities; questions concerning the actual versus estimated quantity of reserves; and uncertainty emanating from legislative matters, in particular legislation concerning emission requirements, reclamation policies, and tax-subsidy considerations.

Burness, HS

Kentucky University IMMR18-PD13-76, June 1976, 39 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-257227/9ST, DOTL NTIS

20 145914

**SURFACE MINING. PART 2. OPEN PIT ORE MINING (CITATIONS FROM THE ENGINEERING INDEX DATA BASE)**

Drilling and blasting practices, developments in mining machinery, slope stability research, and the use of computers to solve geological and mining problems are discussed. A few abstracts cover the economics of ore mining, surface transportation systems, and estimates of ore reserves. (Contains 97 abstracts)

See also PS-760810.

Hundemann, AS

National Technical Information Service Biblio. Oct. 1976, 114 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PS-760812/8ST, DOTL NTIS

20 147596

**RAIL TRANSPORTATION OF WESTERN COAL AND OTHER COMMODITIES 1975 TO 1995**

The ability of western railroads to transport massive quantities of Western coal is examined in this report. Its most import aspect is consolidation of micro movements into various industries such as transportation and energy. The report is designed primarily for use by electric utility management and is intended to be most useful in the planning stages of additions to electric power generation capacity. There are three major sections: Supply, Demand, and Transportation.

Planning and Forecasting Consultants Final Rpt. Aug. 1975

ORDER FROM: Planning and Forecasting Consultants 863 Frostwood, Houston, Texas, 77024

20 148301

**LUMBER POTENTIAL FOR CULL LOGS IN THE PACIFIC NORTHWEST**

This study indicates that the economic feasibility of using cull logs for lumber manufacture is marginal except in times of extremely high lumber prices. Lumber price cycles and similar cycles in prices of products of pulp and plywood industries which compete for the cull log raw material tend to work against development of lumber processing capacity and residue reduction programs designed specifically for cull logs.

Snellgrove, TA (Forest Service); Darr, DR *Forest Products Journal* Vol. 26 No. 7, July 1976, pp 51-54

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

20 148307

## IMPACT OF COAL ON THE INDUSTRIAL ECONOMY

Certain key guidelines are assumed, including: promotion of conservation of energy usage through elimination of waste and improved efficiency of industrial processes; increased availability of coal and uranium, so that oil and gas will be essentially eliminated as electric power and industrial process fuel; economic conversion timetables; and financial incentives plus realistic legislation to make it happen. Supplementary energy sources are briefly discussed, as well as their expected impact on the industrial economy in the near-term (1976/1985) and the longer term (beyond 1985). The effect of conversion timing as well as technical, financial and facility limitations are discussed, including past and future power plant costs for oil/gas fuel versus coal. The paper concludes with a short discussion of the problems that the profit-oriented manager has in achieving compatibility between his National Conscience and making Good Business Decisions.

This paper was presented at the TAPPI Annual Meeting in New York, New York, March 15-17, 1976.

Jackson, WH (American Boiler Manufacturers Association)  
Technical Association of the Pulp & Paper Industry Preprint 1976, pp 309-314

ACKNOWLEDGMENT: EI

ORDER FROM: Technical Association of the Pulp & Paper Industry Dunwoody Park, Atlanta, Georgia, 30341

20 148308

## CASE STUDY OF FUTURE SUPPLIES OF EASTERN LOW-SULFUR COAL: PRICES, BOTTLENECKS AND CONTINGENCIES

This paper describes a model developed to forecast the future supplies and costs of eastern low-sulfur coal. Growth constraints are assessed and future supply curves for the southern West Virginia mines are derived. Because forecasts are highly conditioned by model assumptions, the construction of the model is rather fully described. The model is then used to develop supply estimates for the next fifteen years under varying demand conditions. It is concluded that eastern low-sulfur coal can play an important role in meeting environmental and energy policy objectives between 1980 and 2000, if labor constraints can be overcome and a market for low-sulfur steam coal developed. Before and after that period its potential impact will be minimal. Costs will be reasonable if historic growth in productivity is reattained. Based on model results suggestions for regulatory policies are framed.

This study was presented at the 2nd Symposium on Coal Utilization, National Coal Association/Bituminous Coal Research Conference and Expo 2, held in Louisville, Kentucky, October 21-23, 1975.

ACKNOWLEDGMENT: EI

ORDER FROM: National Coal Association 1130 17th Street, NW, Washington, D.C., 20036

Hieronimus, WH (Charles River Associates, Incorporated)  
National Coal Association Conf Paper 1975, pp 151-166

21 052893

**CONTINUOUS MEASUREMENT AND CONTROL OF THE SPEED OF WAGONS SHUNTED OVER HUMPS. COSTS OF THE VARIOUS SYSTEMS**

The report contains a calculation of the costs of automatic hump yards, incurred for the following systems: (a) DB system with primary and secondary retarders and conveyor devices; (b) SNCF system with primary and secondary retarders; (c) BR system with hydraulic retarding and boosting units. The cost calculation according to uniform standards is based on the installations described in Report D 74/RP 4 with 32 and 48 sorting sidings and it covers: (a) The cost of investments, (b) Capital charges, (c) Operating cost. For each installation the total costs and the specific total costs relative to one shunted wagon are indicated. A comparative assessment of the various systems according to the cost involved is rather problematic on account of the divergent economic conditions. The indicated details can only be used as informatory for special investigations.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways D74/RP 5/E, Apr. 1971, 29 pp, 6 Fig., 24 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

21 052894

**STUDY OF A LIGHTER BRAKE SLIPPER. PRESENT POSITION WITH REGARD TO BRAKE SLIPPERS. SURVEY OF WORK CARRIED OUT**

This report surveys the position with regard to the use of the brake slipper by the various Administrations. It shows how the imperfections of the current designs of slippers, especially as regards the weight, led to the formation of the Committee. A summary is given of the studies already carried out, and mention is made of the general lines of study decided upon in July 1968.

The use of this document is restricted to ORE Member Administrations. Not available to third parties.

International Union of Railways D91/RP 1/E, Oct. 1968, 15 pp, 12 Fig., 7 Tab., 2 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

21 052895

**STUDY OF A LIGHTER BRAKE SLIPPER. RECOMMENDATIONS FOR THE DESIGN AND MANUFACTURE OF A LIGHTER BRAKE SLIPPER**

The results of extensive tests indicate that at the moment the only material which can be considered for the manufacture of a lighter brake slipper is steel. A prototype is presented and is referred to as the ORE brake slipper. It is shown that, compared with the current weights of brake slippers, a reduction of about 25% can be obtained. This report provides the Administrations with the possibility of selecting the most suitable design characteristics.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. D91/RP 2/E, Oct. 1970, 19 pp, 31 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

21 130198

**AUTOMATION OF THE TRAIN TIMETABLE [Avtomatizatsiia razrabotki grafika dvizheniia poezdov]**

This publication presents the methods and computer programs for developing timetables. Included are results of the calculation of optimum schedules for freight trains on double-track sections as well as suggestions for the solution on single-track segments, the rationalization of a local operating group during formation of the timetable, optimization of the work and rest periods of the locomotive crews, and utilization of computer programs for

developing a schedule for operating and managing double-track lines. The book is intended for technical engineers, computer centers and technicians who develop automated control systems. Chapters: (1) General characteristics of the problem of schedule automation; (2) Computer modeling process for the schedule of a double-tracked line; (3) Algorithm for producing the timetable, including a "window"; (4) Some problems in using algorithms for calculating freight train timetables on single-track lines; (5) Automated calculation for staffing when developing schedules; (6) Optimization of the work and rest intervals of locomotive crews involved with scheduling in the timetables; (7) Timetables in an automated control system. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Tishkin, EM

All-Union Labor Red Banner Railway Research Inst Proceeding Ts.N.I.I. No. 517, 1974, 136 pp, 39 Fig., 18 Tab., 37 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

21 130233

**RAILROAD OPERATOR'S REFERENCE BOOK [Spravochnik ekspluatatsionnika]**

This book contains reference materials for the conditions and organization of passenger and cargo transport, the technical normalization and methods of analysis of operational work, calculations of technical norms and indices of rolling stock operation, organization of train traffic, methods of complex regulation of railway car and locomotive fleets, prime cost of transportation, work production, and other problems of railroad operation. Data is provided for the technical control of roads (track and track management, stations and junctions, locomotives, railway cars and railcar management, automation, communication, electrification and energetics, and means of mechanization), characteristics of their basic elements, maintenance and operational norms, and computations. Special selections of the handbook are dedicated to the application of computational technology and mathematical methods in the solution of operational tasks, general transportation problems, and problems of cadres, labor, and salary. The reference book is intended for technical engineering and management workers connected with the organization of train traffic, cargo and spurtracks and transport shops of industrial enterprises, as well as students and instructors of the railroad technical institutes. The chapters are (1) General transport information, USSR and abroad; (2) Technical railroad means; (3) Passenger transport; (4) Organization of operational procedure; (5) Passage allowing and transportational capability of railroads; (6) Application of mathematical methods and computational technology; finally, (7) Labor and salary. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Transport Publishing House 1971, 704 pp, 156 Fig., 360 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmanyi Tupik, 6a, Moscow B-174, USSR

21 130234

**PROBLEMS IN THE OPERATION OF RAILROADS [Voprosy ekspluatatsii zheleznykh dorog]**

This issue presents the following five reports. (1) Optimal distribution of tractive power based upon the weight and speed of the cargo train on a computed profile. This report reveals methods, norms, and results of research with the use of electronic computers on calculated speeds for various existing types of locomotives and over long-term conditions. Used as the optimality criterion is hourly productivity of the locomotive (train). Transport expenditures are detailed. Calculated speeds at the present time are optimal in none of the criteria; a differentiation of calculated speeds independently of track profile is recommended. (2) Composition of passenger and cargo train traffic schedule on two-track sections. This report shows that the least delay of trains of various categories during passage on a section is derived from simultaneous composition of their traffic timetable. An algorithm is proposed which takes into account simultaneous plotting of various categories of trains. (3) Optimization of the network schedule for terminal operation of circuit and railroad tracks of industrial enterprises. Choice of the optimal variant is accomplished according to hierarchical criteria; these are technological, cost, and operational. The indices of these

criteria are respectively, volume of switching rail cars, average idle period, and operational interaction between the station and industrial tracks; expenditures for switching the rail car. The final criterion is characterized by a minimum of maximal mismatches during fulfillment of the network timetable. (4) Influence of the irregular flow of loads on parameters of terminal arrangements. The report presents methods for the analytical expression of flows on requirements and service at the terminals, as well as conditions of interaction between these two flows. Also the statistical modeling method as applied to the definition of fundamental processes together with the analytical dependence. On the basis of research into the processes, including irregularity, methods for locating their basic parameters are proposed. (5) Formation of the casual full-scale plate on the electronic computer, depending upon the rail car flow; this presents the influence of the volume and nature of the rail car flow on the splitting up of carrier trains on junction cargo stations. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Institute of Engineers for Railroad Transportation Report No. 360, 1971

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 21 130235

#### THE CONTAINER TRANSPORT SYSTEM [Konteinernaia transportnaia sistema]

This book, written by a large group of specialists in various types of transportation, examines many problems connected with developing and establishing in the USSR a container transport system (CTS). Beginning with general problems of container transportation and its historical development, the study goes on to lay out in detail the technical-economic and operational characteristics of applied and prospective technical means of railroad, water, truck, air and industrial transport (e.g. universalized and specialized containers, rolling stock, cargo transport means), as well as the technological fundamentals of the function of container transport systems, the economics of containerized transfers, and finally their rules and legal regulations. The experience of containerization outside the USSR is also utilized. This book is intended for scientific and technical engineering workers of main-line and industrial transport, and can be utilized as well in the capacity of an educational textbook in the higher educational institutions. The chapters are (A) The Development of Container Transport in the USSR and abroad: 1) Container transport in the USSR; 2) Fundamentals of CTS; 3) Container transport abroad; (B) Technology of CTS: 4) Structure and classification; 5) Technical requirements for containers; 6) Universal containers; 7) Specialized containers; 8) Container test methods; 9) Rolling stock for container transport; 10) Shifting means; 11) Automatization of shifting methods; 12) Containerized points; (C) Organization and Economics of Containerized Transport: 13) Planning, normalization, and stock taking; 14) Organization of container transport; 15) Technological labor processes of containerized points; 16) Automation of container transport control; 17) Tariffs; 18) Technical-economic effectiveness of container transport; 19) Legal regulations. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Transport Publishing House 1974, 432 pp, 136 Fig., 71 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

### 21 130236

#### THEORETICAL PRINCIPLES OF THE CONTAINER TRANSPORT SYSTEM OF THE U.S.S.R. [Teoreticheskie osnovy konteinernoi transportnoi sistemy SSSR]

This book presents methodical principles, main parameters, and a general scheme of formation for a Container Transport System (CTS) in the USSR, to be used for internal and international communications. Widespread use of progressive methods requires significant increase in the volume of containerized and package transport, broadening of their spheres of application to such forms of transport as aviation, and inclusion of a maximum number of branches of industry, construction, supply, and trade. The material and technical base must be developed for the whole complex of technology for cargo shippers and receivers; a system of organization and

administration which will ensure speedy through passage of containers in all forms of transport must be created; and a scientific system of prospective and current planning must be put into action. The book is intended for economists and technical engineering and scientific workers of all types of transport, as well as for scientific workers of all branches of the national economy concerned with the problems of containerization and packaging transportation. The chapters include: (1) Development state and prospects of container and package transport; (2) Methodological fundamentals and general formulation scheme of CTS/USSR; (3) Management system; (4) Classification and parameters of the technology; (5) Technology of packaged cargo transport; (6) Methods and sequence of planning; (7) Fundamentals and methods of economic regulations; (8) Tariffs for transportation of freight and methods for their improvements; (9) Organization and legal commercial regulation; (10) Principles of container points' technology; (11) System of transportation-expeditional service (TES); finally; (12) The development of container transport in international communications. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Institute of Complex Transport Problems (GOSPLAN) 1975, 240 pp, 5 Fig., 36 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 21 130239

#### INSTRUCTIONS FOR RAILROAD TRAFFIC AND SWITCHING ON SOVIET RAILROADS [Instruktsiia po dvizheniu poezdov i manevrovoi rabote na zheleznykh dorogakh Soiuza SSR]

This handbook covers the following information: (1) Train traffic during automatic blocking; (2) Train traffic on sections equipped with centralized dispatching; (3) Train traffic during semiautomatic blocking; (4) Train traffic in an electrical rod system; (5) Train traffic with telephonic communication means; (6) Order of train traffic during interruption of the action of all established means of signaling and communication; (7) Traffic of maintenance trains (railway motor cars), fire trains, and auxiliary locomotives; (8) Train traffic (railway motor cars) during work production on railroad tracks and constructions; (9) Reception and departure of trains; (10) Operation of the train dispatcher; (11) Shunting operation at the stations; (12) Sequence of distributing warnings; (13) Reception and departure of trains under conditions where normal operations of the automatic blocking system are suspended at the stations; (14) Train traffic with demarcated time. The appendices are: (1) A list of solutions for train departures from the station with various means of signaling and communication during train traffic; (2) Norms and fundamental regulations for securing rolling stock by means of brake shoes and hand brakes; (3) Procedures for setting up in the train wagon loads which require exceptional caution and special rolling stock. Finally; (4) The sequence of trolley traffic. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1973, 303 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

### 21 130277

#### AN IMPORTANT STEP IN THE DEVELOPMENT OF RAIL TRANSPORT [Vazhnyi etap razvitiia zheleznodorozhnogo transporta]

Growth of freight traffic is foreseen to be about 22%, of the passenger traffic, 14-15%. With the aim of rationalization of transport, important work has been carried out on the development of optimal plans for standard freight flows. The realization of the worked out measures allowed a reduction in the volume of redundant transportation during the ninth five-year plan of approximately 125 billion km./tons; and a fall in the transport expenditures for branches of the national economy by approximately 500 million rubles. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

Gundobin, NA *Zheleznodorozhnyi Transport* No. 2, 1976, pp 6-16, 9 Phot.

ACKNOWLEDGMENT: FRA



ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmanaya ul. 4, Moscow B-174, USSR

21 130282

**DEVELOPMENT OF THROUGHPUT AND CAPACITY OF RAILROADS [Razvitie propusknoi i provozhochnoi sposobnosti zheleznnykh dorog]**

In order to handle growing traffic, ensure stable and economical transportation, and improve the service to new industrial regions, during the last five-year plan there have been constructed over 36,000 km of new railroad lines, which is significantly higher than 1966-1970. Under the conditions of growing traffic volumes the role and significance of yards and junctions is continually growing. During the ninth five-year plan nine new classification yards and systems were constructed, the development of 1148 new stations and junctions was realized, including 27 sorting, 51 sectioning, and 1070 intermediate ones. Increase of the throughput and capacity of railroads in the ninth fifth-year plan is ensured as well because of the further electrification of lines, the broadening of the network range serviced by diesel traction, and the introduction of more powerful electric locomotives and diesels. The increase of power and maneuverability of the transport system, and increase of the throughput and capacity of railroads creates important prerequisites for raising the level of operations. Under these conditions railwaymen are invited to achieve increases in the effectiveness of utilization of technology and, on this basis, improve the transport service of the national economy. [Russian]

Full translation available for reference. Contact Technology Planning Officer, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

Perminov, AS *Zheleznodorozhnyi Transport* No. 1, 1976, pp 14-21

ACKNOWLEDGMENT: FRA

ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmanaya ul. 4, Moscow B-174, USSR

21 133305

**A COOPERATIVE PROGRAM OF EXPERIMENTS INVOLVING CHANGES IN RAILROAD OPERATIONS**

The report describes the results of the second full year of activities in the St. Louis Terminal of the Missouri Pacific Railroad, where railway labor and management are cooperating in introducing improvements to terminal operations. This is accomplished through a series of experimental changes which are introduced for a specified time period, evaluated on a before and after basis, and if local labor and management agree, are instituted as permanent improvements. The thrust of the experiment has been in the areas of labor agreements, carrier agreements and governmental regulations which for one reason or another are thought to impede the efficient operation of the terminal.

Labor/Management Task Force on Rail Transportation, Federal Railroad Administration, Missouri Pacific Railroad, Association of American Railroads Prog. Rpt. FRA/OPPD-76-1, No Date, 156 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-251735/7ST, DOTL NTIS

21 139310

**EQUITABLE TRANSPORTATION SERVICE AND UNIT TRAINS**

While the Interstate Commerce Act prohibits common carrier transportation firms from practicing service discrimination and railroads have been able to provide efficient service for high volume shippers through the use of unit trains, smaller shippers have argued before the ICC that unit train service discriminates against them by depriving them of an adequate car supply. ICC has justified keeping a maximum of 20% of the car fleet in unit train service because of the volumes handled and cost effectiveness. This paper models the impact of unit train operation on the smaller shippers and proves that car supply for all shippers is improved. It also finds the ICC's 20% maximum is inappropriate and likely curtails the supply of cars for small shippers.

Requests for this publication should be directed to J.G. Britton, Director of Operations, AAR Technical Center.

Romig, WJ

Association of American Railroads Technical Center Apr. 1974

204

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

21 139443

**MANUAL OF CAR UTILIZATION PRACTICES AND PROCEDURES**

Task 1 of the AAR Car Utilization Research and Demonstration Program includes an analysis of current practices and problems in freight car usage. The Manual is published for use by all railroads, users of rail transportation and others involved in rail transport. The manual is decision-oriented, containing examples of forms and reports actually in use. The interface between car utilization and other phases of rail management is defined. The manual is divided into nine sections in three parts: Management of Car Utilization; Control of the Car Fleet and Supporting Functions. Bibliographic information appears at the ends of appropriate chapters and a general bibliography is presented in the appendix.

A joint Industry-Government Program-AAR-FRA.

Association of American Railroads No. R-234, June 1976, 285 pp, Figs., Tabs., Refs., 3 App.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

OB-259349/AS, DOTL NTIS, DOTL RP

21 139444

**CAR UTILIZATION FINAL TASK FORCE REPORT. RECOMMENDED RESEARCH PROGRAM**

In recent years, shippers have not received the number of cars requested at certain times of the year and for certain commodities. Their expressions of concern have created a widespread conviction that an extensive car shortage exists. Since an increase in car utilization would effectively increase the car supply, a research and action program directed at improving car utilization has been prepared. An improvement in car utilization could be achieved by a reduction in the percent of time a car is unserviceable, a reduction in car cycle time, a decrease in empty line haul car miles, an increase in percentage of volume or weight capacity used by shippers, or an increase in revenue per loaded car mile. While estimates of 100 to 200 percent increases in car utilization over present practices have been projected, a significant but smaller increment of improvement is probably all that can be achieved without revolutionary changes on the part of shippers, railroads, and government agencies. A quantitative assessment of the potential for improvement can be made when an adequate data base on car cycles is available. Car utilization is expressed in terms of a wide variety of indices. None is wholly satisfactory for evaluation of all aspects of car utilization, and none in common use permits analysis of the economic effectiveness of use of the car fleet. As a basis for improvement in car utilization, a three phase, eight year program has been recommended. Projects in the first phase, two-year program include: 1. Analysis of current practice and problems; 2. Development of car utilization measurement standards; 3. Collection of data for a more complete car cycle analysis; 4. Recommendation of projects for FRA consideration; 5. Analysis of the impact of AAR and ICC rules, directives, and orders on car utilization; and 6. Study of freight car time reliability. Each of these projects is expected to identify specific opportunities for improvement in car utilization.

Association of American Railroads Technical Center R-210, July 1974, 87 pp, 2 App.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

21 139445

**RAILROAD RELIABILITY AND CAR UTILIZATION: AN INTRODUCTION**

The experimental program proposed in this report attacks two of the most pressing problems facing the railroad industry today. The increasing costs of purchasing and financing freight cars have become a significant obstacle to the renewed economic health of the industry. At the same time, railroads currently provide a service that suffers in comparison not only with motor carriers, but with the potential for rail service as well. The failure to fulfill

this potential results in a misallocation of transportation resources that has been estimated to cost the American public billions of dollars annually. Now, for the first time, with the existence of the Freight Car Utilization Research/Demonstration Program, we have the proper forum and the necessary resources to deal with these problems. The F.R.A. urgently endorses any effort such as this in which the industry actively seeks free enterprise solutions to its own problems. This report proposes that a number of railroads attempt changes in their operations, facilities, or institutions in order to determine the resulting impacts on reliability, car utilization, and profitability. The concept of conducting experiments as a guide to future policy decisions is extremely important because it provides management with the facts necessary to formulate strategies for revamping rail systems. The F.R.A. therefore, urges each railroad to participate in this program.

Prepared for AAR by the Industry Task Force on Reliability Studies and M.I.T.

Massachusetts Institute of Technology No. CTS 75-8, July 1975, 58 pp, Figs., Tabs., 32 Ref.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

21 139446

### FREIGHT CAR CLEARINGHOUSE EXPERIMENTS: AN INTERIM EVALUATION

The utilization of freight cars has long been recognized as a major problem facing the railroad industry. One aspect of car utilization is the cross-haul of empties between railroads when Car Service Rules and Directives forces more empty movement than is necessary. This cross-haul could be reduced through cooperation between railroads and the practicality has been validated through experiments. The Clearinghouse Experiment of Southern, Missouri Pacific and Milwaukee is an example of such cooperative action. ICC granted exemption from Car Service Rules and AAR Car Service Division from relocation directives. The experiment is still in effect but this report provides a quantitative measurement of the impact of the procedures during the first two months of operation. It was shown that car supply can be protected by balancing car flows, that dramatic improvement in utilization can be achieved by a reduction in empty cross haul, that additional incentives are needed for loading foreign cars and that conflict between improved utilization and the need to increase off-line car hire has not been resolved.

Dingle, AD (ADD Systems)

Association of American Railroads Aug. 1975, 40 pp, Tabs., 3 App.

ACKNOWLEDGMENT: AAR

ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

21 139464

### PROBLEMS OVER INCREASING THE TRAFFIC CAPACITY OF RAILWAY YARDS AND JUNCTIONS [Problemy uvelicennija pererabotajusej sposobnosti stancij i uzlov]

The article analyses these problems and defines the prospects for developing the capacity of railway yards and junctions during the tenth Russian Five-Year Plan (1975-1980). It goes on to examine the problems involved in: improving the layout of railway yards and junctions, marshalling-yard mechanisation and automation, increasing the number and length of service tracks, and various other aspects. [Russian]

Bolotnyj, VJ *Zheleznodorozhnyi Transport* No. 3, 1976, pp 11-16, 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Zheleznodorozhnyi Transport Novo-Basmanaya ul. 4, Moscow B-174, USSR

21 139526

### BRITAIN'S HEAVIEST TRAINS

With its 2000-ton triple-headed iron-ore trains, Western Region's Cardiff Division can claim the heaviest in Britain. Running at sustained speeds of 60 mph they are far from being the slowest.

Ford, R *Modern Railways* Vol. 33 No. 334, July 1976, p 258, 6 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: University Microfilms International 300 North Zeeb Road, Ann Arbor, Michigan, 48106

DOTL JC

21 139531

### INTERCONTAINER: THE TRANSPORT OF LARGE CONTAINERS ON A EUROPEAN SCALE

Interview with the General Manager of Intercontainer in which the Company's activities since it was founded at the end of 1967 are described together with future plans.

Flechon, G *Rail International* No. 6, June 1976, pp 315-320, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

21 141124

### THE RAILCAR NETWORK MODEL

This report describes a railway planning tool. It represents a five-year development activity directed at the creation of a set of analytical models that can be used to analyze yards and line sections. These component models are integrated into a model of an entire system. Thus, the tools presented here are usable for the study of individual parts of a railway or can be directed at the study of the complete railway system. This report is divided into four parts: (1) Overview of the Railcar Network Model; (2) Line Model; (3) Yard Model; (4) System Model. The first part provides an overview of the total model and how the components fit together. It also describes the capabilities and limitations of each. The remaining parts present the details of each component model and the overall systems model. In each part the theoretical considerations are first presented, followed by detailed documentation on the computer programs used to implement the model. The computer programs are all written in Fortran.

Petersen, ER Fullerton, HV

Canadian Institute of Guided Ground Transport, (CIGGT Project N.5.1) R&D Rept. CIGGT Rept. N. 75-11, June 1975, 306 pp, 54 Fig., 14 Tab., 49 Ref.

ACKNOWLEDGMENT: CIGGT

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DOTL RP

21 141131

### BULK QUEUES WITH RANDOM BATCH SIZE: WITH APPLICATION TO RAILROAD MODELLING

With train length restricted and railcars entering the system randomly, the maximum block size which may be set on trains at intermediate yards is a random variable. The time a car waits for pickup can be modelled as a bulk service queue with random batch or block size. Frequency of block pickups depends on the number of trains per day and maximum block size depends on available space on the train after the local block has been set off. In this paper the queueing model (random bulk), when arrival time of cars is exponentially distributed and train arrival time is an Erland distribution of order K, is solved.

This work was supported under CIGGT Project 5-10.

Petersen, ER

Canadian Institute of Guided Ground Transport No. 71-3, Aug. 1971

ACKNOWLEDGMENT: CIGGT

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DOTL RP

21 141133

### A RAIL CAR NETWORK MODEL OF THE CANADIAN PACIFIC RAILWAY SYSTEM

A network flow model has been prepared which determines an optimal routing of railcars over the Canadian Pacific Rail System. A demonstration run of this model has been performed using a CDC 6600 computer. The network used in the demonstration has 26 yards and 41 connecting track segments. A table of demands for movement of loaded rail cars from each yard to each other was obtained historically. Component models describe the time delay due to (a) inspection and classification; (b) assembly and outbound inspection; (c) over-the-road transit, switching delays and station

working time. Time effects of congestion enter chiefly through a classification queue, a train assembly bulk queue, and the meet and overtake delays due to the interaction between passenger trains, through freights and way freights on a single-track line. Detailed modelling of the network structure allows bypass operation with pickups and setoffs, and sharing of common single tracks by various types and routings of trains. Results show the flows in railcars per day that minimize total flow-time in car-minutes over the entire system. Also various items of travel time data within yards and over the road are provided.

This work was supported under CIGGT Project 5.10.

Fullerton, HV  
Canadian Institute of Guided Ground Transport Jan. 1972, 44 pp, Figs.,  
Tabs., 6 Ref.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

**21 141134**  
**A RAILCAR NETWORK MODEL OF THE CANADIAN NATIONAL RAILWAY SYSTEM**

This report summarizes the steps which were taken to apply a generalized railroad model to the Canadian National Railway system. The model is designed to assist the railroad in medium and long range planning, by forecasting in a broad sense what the effects on the total system will be, given changes in either the demand for transportation services, or in the system operating procedures of the railroad. The railcar network model expresses the system wide car-flow characteristics in terms of the influence that congestion and other time delay factors impose on the basic origin-destination transportation requirements. This concept has been applied to the CN system, and data has been analyzed to ensure that the vital, under-laying relationships in the "real world" are adequately represented in the model. This validation study has had direct impact in two major areas; with respect to over-the-road times, a provision for meet and over-take delays between different categories of trains was introduced into the model, and secondly, provision for specification of the distribution of train inter-departure times from each yard along each track section was included. Some further theoretical work on this latter point remains to be completed.

This work was supported by CIGGT Project 5.10.

Taylor, AJ  
Canadian Institute of Guided Ground Transport No. 72-2, Jan. 1972, 26  
pp, Figs., Tabs., 4 Ref.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

**21 142272**  
**BRINGING COAL OUT OF THE CANADIAN WILDERNESS**

Design of a unit-train system to move the coal quickly and economically is described. Solution was four unit trains, each made up of 87 100-ton cars and each pulled by four CN diesel units. One train can be loaded at the mine while another is being unloaded by Neptune Terminal at Port Mann near Vancouver, while the two other trains are in transit to and from these sites. Loaded coal is sprayed with coal binder (latex) to decrease wind loss on 800-mile trip between mine at Grande Cache, Alta., and dock facilities at Vancouver-area ocean ports.

*Railway Age* Vol. 177 No. 10, May 1976, p 52

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

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**21 142305**  
**CONTAINER TRAINS AT ELECTRIFIED CONTAINER STATIONS [Containerzuege auf elektrifizierten containerbahnhoeften]**

The author starts by describing the basic technological concept of the container transport system and then calculates the speed necessary for the container train to reach the transshipment track by momentum where there is no catenary. [German]

Geissler, G *Hochschule fuer Verkehrs F List Wissenschaft Zeitschr* Vol. 22 No. 4/5, 1975, pp 909-918, 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hochschule fuer Verkehrswesen —Friedrich List— Friedrich List Platz 1, Dresden 801, East Germany

**21 142308**  
**COMPARISON OF TRANSPORT SYSTEMS FOR MOVING ORE TRAFFIC FROM MARITIME PORT TO THE RUHR [Vergleich von Transportverfahren fuer den Erztransport vom Seehafen zum Ruhrgebiet]**  
No Abstract. [German]

Bahke, E *Forschungsberichte des Landes Nordrhein-Westfalen* No. 2452, 1975, 38 pp, 16 Ref., 21 App.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Westdeutschen Verlag GmbH Opladen, West Germany

**21 142523**  
**THE MOST MODERN CONTAINER STORAGE INSTALLATIONS AND NEW RAILWAY INSTALLATIONS IN THE HAMBURG PORT RAILWAY STATION AREA [Modernste Containerstapelanlage und neue Eisenbahnanlagen im Bereich der Hamburger Hafenbahn]**  
With these container storage installations, which are the last stage in development work at the Eurokai KG sea port terminal at Hamburg-Waltershof, it is possible to place 4,000 containers on top of each other on five levels over a surface area of only 15,000 square meters approximately. The gantry cranes are fully automated and controlled by a process computer. [German]

Hoefler, R *Verkehr und Technik* Vol. 29 No. 6, June 1976, pp 246-248, 2 Fig., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Schmidt (Erich) Verlag Herforder Strasse 10, 4800 Bielefeld, West Germany

**21 142943**  
**MOVEMENT OF DOMESTIC SURFACE MAILED BY INTERMODAL SERVICES**

Cooperation between the Canada Post Office and Canadian National Railways and CP Rail has produced an intermodal mail service which is flexible, economical, of high service quality and at highest fuel economy. The facilities, piggyback services and operating and control techniques are described.

Presented at the Seventeenth Annual Meeting of the Transportation Research Forum, Beyond the Bicentennial: The Transportation Challenge, held in Boston, Massachusetts, October 28-30, 1976.

Martin, JF (Canada Post)  
Cross (Richard B) Company Proceeding 1976, pp 404-411

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

**21 144087**  
**AMERICA'S FREIGHT SYSTEM IN THE 80'S AND 90'S.....BUT HOW TO GET THERE?**

These papers relating to technology and freight transportation have been prepared for the conference on America's Freight System in the 80's and 90's. It does not purport to be a compendium on all advanced freight technology but is to give an overview of problems and possibilities. The chapters: Forces of Change in Transportation; Testimony before the Subcommittee on Aviation and Transportation R&D; Intercity Transportation- Air Freight Transportation; A View of Air Freight Developments in the Next Decade; Software Technology and the Quantum Leap; Cargo Aircraft Technology in the Context of Economics; TRAILS--A New Concept in Freight and Passenger Transport; Outlook for Pneumatic Pipelines; International Steam Coal: The New Energy Competitor; Research Opportunities for Railroad Information Systems, 1975-1990; Rail Terminal Information Systems; Southern Pacific's Car Activity System (CAS); The Future Trends in Railroad Motive Power in the United States; Air Cushion Technology Contributions to America's Future Freight Systems; Federal Highway Administration Research Effort for Assessing the Economic and Safety Implications of Increased Truck Size and Weight Limits.

Presented at a Conference sponsored by the US Department of Transportation, Transportation Systems Center, Cambridge, Massachusetts, December 1-2, 1976.

Transportation Systems Center 1976, 244 pp, Figs., Tabs.

ACKNOWLEDGMENT: TSC  
ORDER FROM: TSC

21 144094

**NATIONAL INTERMODAL NETWORK FEASIBILITY STUDY.  
EXECUTIVE SUMMARY**

This report is Volume I of the series comprising the National Intermodal Network Feasibility Study. Titles of the four volumes and four appendices of the report are: Volume I-Executive Summary; Volume II-Intercity Freight Transportation; Volume III-Developing a Nationwide Intermodal Network; Volume IV-The Feasibility of a Nationwide Intermodal Network; Appendix 1-The Intermodal Freight Transportation Market; Appendix 2-Transportation Cost Analysis; Appendix 3-Network Perspectives: Train, Link and Terminal Descriptions; Appendix 4-Intermodal Terminal Manual. In summary fashion this volume presents the physical nature of the nationwide intermodal Network developed as a result of the analysis in terms of train operating patterns, link usage, terminal characteristics and railcar equipment. Based upon these components the report describes a possible pattern of traffic and investment growth during its beginning period and suggests the probable revenue and costs implications. Based upon this single start-up scenario a series of shipper, public and carrier benefits are described. This volume concludes with comments concerning the opportunities for technological improvements in a rail/truck intermodal operation.

This four volume report comes in three sections, an Executive Summary, Volumes I-IV, and Appendices I-IV.

Ainsworth, DP Keale, MJ Riker, JB  
Reebie (Robert) and Associates, Incorporated Final Rpt. FRA/OPPD  
76/2, Sept. 1975, 31 pp

Contract DOT-FR-20065

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-258195, DOTL NTIS

21 144095

**NATIONAL INTERMODAL NETWORK FEASIBILITY STUDY.  
VOLUME I THROUGH IV--PART I**

This is the first of a two part series comprising the National Intermodal Network Feasibility Study. Part I contains Volumes I thru IV, and Part II, Appendices 1 thru 4. Volume I is the Executive Summary. Volume II describes the current environment in which various land transportation modes compete for the movement of containerizable freight. It also describes the current patterns of operations of the significant land modes and presents an analysis of their service and economic capabilities. Special attention is given to a discussion of intermodal terminal operations. Finally, the report suggests opportunities for improvement of intermodal operations. Volume III presents the procedures and findings of the study phases that developed a network operating plan. It then compares the service and economic capabilities of an improved intermodal network with similar capabilities of efficient operations of competing modes. And finally it describes the network operations that were developed. Volume IV assesses the feasibility of a Nationwide Intermodal Network by reviewing the operating implications developed earlier. It compares these requirements with the capabilities of today's carriers. It then seeks to evaluate the financial feasibility, cash flow and investment requirement, which are of paramount concern in judging the reasonableness of this transportation alternative. The volume concludes with an examination of alternative organizational and management concepts.

Reebie, RS Ainsworth, DP Liba, CJ Riker, JB Keale, MJ Urba,  
CE  
Reebie (Robert) and Associates, Incorporated Final Rpt. FRA/  
OPPD-76/2.I, May 1976, 420 pp

Contract DOT-FR-20065

ACKNOWLEDGMENT: FRA, NTIS  
ORDER FROM: NTIS

PB-258196, DOTL NTIS

21 144096

**NATIONAL INTERMODAL NETWORK FEASIBILITY STUDY.  
APPENDICES 1 THROUGH 4-PART II**

This is Part II of the National Intermodal Network Feasibility Study, and contains Appendices 1 thru 4. Appendix 1 describes the development of a

national origin/destination containerizable commodity flow data base. Appendix 2 describes the costing concepts that were used throughout the study to compare the economics of intermodal operations and competing land, highway and railway operations. It also presents the expense factors that were determined to be representative of efficiency operations of each mode. Finally it presents the printouts of unit costs that were developed for representative volumes and speeds by the computer model of land costs. Appendix 3 presents a sampling of each of the computer output reports which developed a nationwide intermodal network. It includes complete reproduction of the less voluminous reports. In addition, Chapter 6 of Volume III is reproduced in order to guide the reader through the complex data contained in these reports. Appendix 4 presents a comparison of the investment and costs of the major types of intermodal terminal operating concepts. These are differentiated by the type of equipment utilized. The appendix also presents an analysis of the effects on unit costs of variations in operating requirements, variations that occur at different terminal cities. The manual has been designed to assist intermodal operators to establish the most efficient operating pattern for each local situation.

Reebie, RS Ainsworth, DP Liba, CJ Riker, JB Keale, MJ Urba,  
CE Isacowitc, DA Laughlin, MO  
Reebie (Robert) and Associates, Incorporated, Peat, Marwick, Mitchell  
and Company Final Rpt. FRA/OPPD-76/2.II, May 1976, 351 pp

Contract DOT-FR-20065

ACKNOWLEDGMENT: FRA, NTIS  
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PB-258197, DOTL NTIS

21 147584

**THE ROAD THAT DARED AND DID!**

The operating practices and physical plant improvements of the Florida East Coast Railway are described. At the end of a 13-year strike of operating employees, FEC was a completely changed railroad with two-man crews operating caboose-less scheduled freight trains, some of them for the entire 360-mile length of the Jacksonville-Miami mainline. FEC's operating ratio was 24.9 percent in 1974; its safety record the second best in the industry and the largely single-tracked railroad is run with Centralized Traffic Control and protected with modern safety devices.

Shaffer, FE *Modern Railroads/Rail Transit* Vol. 31 No. 9, Sept. 1976, pp  
104-107, 4 Phot.

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21 147683

**STEEL A LA MODES**

The use of a specially designed pallet, throw-away packaging and overnight movement on flat cars has enabled Illinois Central Gulf to capture steel-products traffic between Chicago and St. Louis, a relatively short rail haul. This truck-rail-truck service has been successful. ICG is expanding the area covered and developing backhauls of brick and other metals.

Endicott, GA *Modern Railroads/Rail Transit* Vol. 31 No. 10, Oct. 1976,  
pp 69-71, 3 Phot.

ACKNOWLEDGMENT: Modern Railroads/Rail Transit  
ORDER FROM: ESL

DOTL JC

21 147685

**FINDING THE WAY**

Norfolk and Western, committed to a policy of fully allocated pricing, rather than out-of-the-pocket costs for piggyback service, has begun to promote segments of its trailer and container traffic which can be profitable. The management, procedures and competitive needs of this operation are described.

Roberts, R *Modern Railroads/Rail Transit* Vol. 31 No. 11, Nov. 1976, pp  
55-58, 1 Fig., 1 Tab., 1 Phot.

ORDER FROM: ESL

DOTL JC

21 147688

**BARSTOW-SANTA FE'S NEW, PIVOTAL YARD**

The \$50 million classification facility at Barstow, CA, is handling 2,700 cars and 75 freight trains daily which proceed in three directions over Santa Fe main lines. Cars are blocked for over 70 destinations. This series of articles describes the physical layout, computer applications, classification procedures, car and locomotive repair and servicing operations, communications and signaling installations, and details of the yard's construction.

*Progressive Railroading* Vol. 19 N July 1976, pp 43-64, 1 Fig., 24 Phot.

ORDER FROM: Murphy-Richter Publishing Company 20 North Wacker Drive, Chicago, Illinois, 60606

DOTL JC

21 147689

**FRISCO GOES FOR PRODUCTION**

A drive for greater productivity that started two years ago with running repairs for cars and has since been expanded to heavy repair for cars and locomotives, to improved track maintenance and most recently to the transportation department, is continuing. Emphasis in transportation functions has been on reduction in freight-car-days per load, in evaluation of scheduling with associated blocking and priorities, changes in yard layout, and further expansion of the MICB (Management Information Control System) which is a computer-based method of assuring quality control for freight service.

Thompson, WF (St. Louis - San Francisco Railway Company) *Progressive Railroading* Vol. 19 No. 7, July 1976, 5 pp, 14 Phot.

ORDER FROM: Murphy-Richter Publishing Company 20 North Wacker Drive, Chicago, Illinois, 60606

DOTL JC

21 147823

**QUASI-CONTINUOUS SPEED CONTROL IN GRAVITY YARDS USING THE DOWTY RETARDER**

Interest in the use of multiple hydraulic retarders to regulate the speed of wagons in hump yards at frequent intervals rather than at a few discrete points in growing steadily. After Westrail had installed Dowty retarders in the new Forrestfield yard near Perth, and SJ set out to equip Helsingborg yard throughout with ASEA screw retarders, SBB decided to make partial use of Dowty retarders in Zurich-Limmattal which is still under construction. Complete mathematical simulation of the behaviour of cuts in a yard equipped with quasi-continuous speed control is as essential for the designer as in the case of classical yards.

Konig, H *Railway Gazette International* Vol. 132 No. 10, Oct. 1976, pp 376-381

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

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21 147867

**HOW WAGONLOAD FREIGHT COULD BE REVOLUTIONISED**

Details are given of a method of wagon load freight distribution devised by the Research Department of BR. The new scheme aims to reduce overall rail vehicle standing time in yards to 1/2-day weekly. The freight network would be organised as 20 areas. The nucleus of each area would be a major depot and within the orbit of each major depot would lie 15-20 minor depots. The major depots would be fed from and feed to their satellite minor depots by an area network of regular-interval shuttle trains; and the major depots would be interlaced by a trunk-haul regular-interval shuttle service. The network would be devised to restrict the average road haul between customers premises and minor depot to five miles, to keep the average minor-major depot haul within the 15-20 mile range, and the average trunk haul between major depots to 125 miles. A cheap swift means of container loading and unloading utilising the forces of gravity is described whereby the containers to be loaded are placed on a platform sloping towards the track; a platform sloping away from the track receives off-loaded containers. /TRRL/

Freeman, BJ *Modern Railways* Vol. 33 No. 331, Apr. 1976, pp 137-9, 6 Fig., 1 Phot.

208

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-222784)

ORDER FROM: Allan (Ian) Limited Terminal House, Shepperton TW17 8AS, Middlesex, England

DOTL JC

21 148265

**RAIL FACILITIES FOR A MAJOR PORT. THE LOS ANGELES EXAMPLE**

An important aspect of the recently completed Master Plan for the Port of Los Angeles is the ungrading and renovation of the ports rail system which is to be accomplished in several phases by the year 1990. The major recommendations involve consolidation of the various rail yards within and adjacent to the waterfront and the abandonment of old and underutilized trackage. The benefits of this consolidation should be quite significant in terms of direct economic benefits as well as improvements in over-all safety and efficiency of operation. The most expensive element of the modernized rail system will be a new classification and hump yard that would serve not only Los Angeles Harbor, but would also have sufficient capacity to handle some of the rail needs of the Port of Long Beach as well. Considering the complexity of the proposed rail plan, it will, of necessity, require coordination with many governmental agencies and private interest.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976. See also RRIS 04 148248.

Walsh, DA (Port of Los Angeles, California)  
American Society of Mechanical Engineers Conf Paper Paper D&O-29, 1976, 6 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

21 148266

**LOCATIONAL DECISION METHODOLOGY FOR INTERMODAL RAIL-TRUCK TERMINALS**

One of the factors that impedes the operation and growth of piggyback service is the traditional executive decision to locate a piggyback terminal on land already owned by the railroad company. Objections to this decision include concern over industrial decentralization, urban congestion within central regions, costs of land for expansion, and social and environmental effects. A methodology is developed which can be used as a tool for determining the ideal location of a piggyback terminal within a metropolitan area. Once developed, the methodology is applied to the Baltimore metropolitan area. The site selection factors are categorized under the headings of rail, highway, market and land characteristics.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976. See also RRIS 04 148248.

Kuhns, RE (Maryland University, College Park); Mulinazzi, TE  
American Society of Mechanical Engineers Conf Paper Paper P&P-35, 1976, 6 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

21 148289

**TRANSPORTATION TRENDS AND TECHNOLOGICAL DEVELOPMENTS**

The profitability of the nation's common carriers, both rail and truck, regulatory issues and the emphasis for change promulgated by the Government, consumer groups, shippers and the transportation industry itself; energy concerns; capabilities and capacities for expansion of transportation services within the U.S. to keep pace with expected industrial expansion; and modification and modernization of union practices and union work rules as they affect operational improvements, technological improvements and carrier profitability, are analyzed.

This paper was presented at the Technical Association of the Pulp and Paper Industry Annual Meeting in New York, New York, March 15-17, 1976.

Briody, JF (Crown Zellerbach Corporation)  
Technical Association of the Pulp & Paper Industry Preprint 1976, pp 221-226

ACKNOWLEDGMENT: EI  
ORDER FROM: Technical Association of the Pulp & Paper Industry Dunwoody Park, Atlanta, Georgia, 30341

21 148298

## RURAL RAILWAY OPERATION IN WEST GERMANY

A study of methods on the Westfälische Landeseisenbahn. Dispatching, manning, operation and integration with affiliated highway service are described.

Davies, WJK *Modern Railways* Vol. 33 No. 338, Nov. 1976, 4 pp, 6 Fig., 6 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Allan (Ian) Limited Terminal House, Shepperton TW17 8AS, Middlesex, England

DOTL JC

21 148309

## AUTOMATING EXISTING CONTAINER PORTS TO INCREASE THROUGHPUT

This article describes the results of a systems study dealing with the

organization and control of existing container handling capabilities at seaport terminals and the possibilities for automation based on three simple stages of development. The first stage provides for the automation of ship to shore and landside cranes, resulting in increased working speeds for the cranes and the trouble-free operation of stowing programs. In the second stage the handling equipment becomes centrally controlled by a terminal process computer which optimizes terminal transport distances on the basis of predetermined stowage and re-stowage programs. In the final development stage the terminal computer is coupled with the commercial computer, the two providing a comprehensive picture of the ongoing activity of the terminal, facilitating improved solutions to organizational problems within the terminal and with the external transport chain.

Berthold, K (AEG-Telfunken); Blocher, G *Cargo Systems International* Vol. 2 No. 10, Nov. 1975, 3 pp

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

22 052967

**UNLOADING OF SELF-DISCHARGING WAGONS IN WINTER CONDITIONS. ENQUIRY REPORT**

The freezing together of certain bulk goods causes considerable operating difficulties in many countries during transportation in winter. If no special measures are taken, the unloading of freight which is frozen together involves considerable expense and a good deal of labor has to be expended on it. A number of methods have been known for some years for transporting, thawing out and unloading bulk goods exposed to frost. These have been developed and tested both on the part of the client and by the railways. A few methods, which are effective and economical in respect of facilitating the unloading process, involve the fact that considerable damage to the wagons has to be taken into account. Consequently, in working out a rational method there must be good co-operation between the railways and their customers. The present report gives a review of the known methods for preventing the freezing together of the freight during transportation on the one hand and, on the other, methods for thawing out and freeing the frozen freight, together with a description of the known equipment and installations used. The object of this report is to give a greater possibility of choosing the best methods appropriate to a particular climatic condition by means of a very comprehensive description of the methods and the experiences of the administrations and the customers. For this reason, the report also contains a description of methods which have either given little satisfaction or are suitable only for very special purposes.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Final Rpt. B109/RP 1/E, Apr. 1969, 70 pp, 22 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

22 053032

**STUDY OF A VIBRATION TABLE FOR TESTING PACKING MATERIALS TO BE USED IN THE TRANSPORT OF GOODS IN RAILWAY WAGONS. OSCILLATIONS WHICH ARISE DURING TRANSPORT IN RAILWAY WAGONS**

Accelerations due to oscillations provide characteristic values of the conditions to which goods are exposed on moving railway wagons. The values of the accelerations are influenced by the design and construction of the vehicle, as well as its state of loading, also by the speed and the condition of the track. In order to provide some data of a general nature, representative values were obtained from the evaluation of comprehensive measurements.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B 61/RP 1/E, Oct. 1964, 17 pp, 12 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

22 053033

**STUDY OF A VIBRATION TABLE FOR TESTING PACKING MATERIALS TO BE USED IN THE TRANSPORT OF GOODS IN RAILWAY WAGONS. BEHAVIOUR OF DESPATCHES OF FRUITS AND VEGETABLES IN TRANSIT FROM ITALY AND FRANCE**

This interim report of Specialists Committee B 61 gives an account of the investigations made to ascertain the vibrations and impacts to which fruit and vegetable consignments are exposed during their journey from the forwarding to the destination station. These investigations were conducted by Working Group B 61/2 (Goods) in accordance with the programme of work which was approved by the Control Committee during its 46th meeting, held at Minden (Westphalia) on 26th and 27th June 1963. The results of the investigations have shown that it is not possible to establish a definite relationship between damage to the packaging material of the consignments and oscillations of the wagons during the journey. It is therefore reasonable to assume that the influence of wagon oscillations on damage to the packaging material is insignificant when compared with the influence exerted by the method of loading the consignments and the impacts sustained during shunting. The results of oscillation measurements

made by the Working Group B 61/1 (see B 61/RP 1) have confirmed this since only small accelerations were recorded. In order to corroborate this conclusion it would be necessary either to carry out a very large number of test runs or to build a large vibration-table, making it possible to simulate wagon movements during running as well as the actual methods of loading. In view of the very high costs which would be incurred in carrying out either of these solutions, and taking into account the relatively slight importance of wagon oscillations when consignments are properly loaded, the Committee recommends that the activities of the Committee should be concluded and the question B 61 should be closed. The Committee is, however, of the opinion that it would be worthwhile to define the conditions to be followed for various methods of loading. This new study should take account of the results of the experience contained in the present report and should be integrated into the question at present being studied by the Sub-Commission "Claims Prevention" of the 4th Commission of the UIC.

Restrictions on the use of this document are contained in the explanatory material.

International Union of Railways Intrm Rpt. B 61/RP 2/E, Oct. 1964, 9 pp, 18 Fig., 10 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

22 093776

**DEVELOPMENT OF HEURISTIC PROCEDURES TO ANALYZE THE PRODUCTION-TRANSPORTATION PROBLEM**

A methodology has been developed to systematically analyze a production-transportation problem subject to stochastic demand. First the problem is transformed into a network flow equivalent. Then flow data are generated through a series of simulation runs, using a simulation program developed around the out-of-kilter algorithm, GASP II subroutines, and demand determined by Monte Carlo procedures. The data are then interpreted using developed procedures to determine plant market pairs which could be candidates for increase/decrease of flow depending on established conditions. An example problem is provided to demonstrate the usefulness of the methodology and the data available after a simulation run. The example problem has been constructed with production costs and transportation costs between any plant-market pair being nonlinear.

Worrel, EJ III Hogg, GL  
Waterways Experiment Station Tech. Rpt. CERL-TM-D-61, Oct. 1975, 74 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A016984/7ST, DOTL NTIS

22 139524

**NEW DIRECTIONS OF CHEMICAL PROCESSING OF KANSK-ACHINSK BASIN COAL [Novye napravleniya khimicheskoi pererabotki uglei Kansk-Achinskogo Basseina]**

Conditions for open-pit mining in Kansk-Achinsk Basin in East Siberia are very favorable. It is possible to mine about 1 million of coal per annum by this method. The seams are up to 50-70 m thick. At present 90% of coal mined here is used locally in Krasnoyarsk and Irkutsk regions. Its transportation is economically feasible only at distances well below 2000 km. The distances to the European part of the USSR where energy is required are 4,000-5,000 km, however. Therefore, several possibilities of chemical processing of Kansk-Achinsk coal for long-distance transportation are considered. One is the production of "thermocoal" by high-speed heating of coal to the temperature of 400-550 C in a three-stage system of vertical chambers. Another is hydrogenation together with petroleum fraction with the b.p. above 260 C. Railroad and pipeline transportation of coal products are considered. [Russian]

Krichko, AA (Institute of Mineral Fuels, USSR); Semenov, LV *Ugol*  
Vol. 80 No. 91, 1974, pp 62-66

ACKNOWLEDGMENT: EI  
ORDER FROM: Mezhdunarodnaya Kniga Smolenskaya sennaya pl 32/34, Moscow G-200, USSR



22 141108

**TRANSPORTATION PROBLEMS WITH SOME X SUB IJ NEGATIVE AND TRANSSHIPMENT PROBLEMS**

The general solution process of the Hitchcock transportation problem resulting from the application of the method of reduced matrices may give solutions with some negative x sub ij values. This paper is devoted to a review of the reduced matrices method, an examination of suitable interpretation of sets of x sub ij which include some negative values, and ways of interpreting these values in useful modifications of the Hitchcock problem. Such modifications include a) the reshipment problem, b) the overshipment problem, and c) the transshipment problem. Techniques are developed for determining and elimination c sub ij which are not optimal. These techniques and results are useful in solving the problems indicated above. The natural applicability of the simple and general method of reduced matrices is emphasized.

Dwyer, PS (Michigan University, Ann Arbor) *Naval Research Logistics Quarterly* Vol. 22 No. 4, Dec. 1975, pp 751-775, 12 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

22 141136

**FREEZING PROBLEMS DURING RAIL TRANSPORTATION. STATE-OF-THE-ART STUDY (PART I)**

This report is a compilation of information on the freezing of bulk commodities in rail cars and discusses the current state-of-the-art in solving such problems. Solutions to freezing of materials such as coal, iron ore and concentrates are classified in three categories: Treatment of materials prior to shipment to prevent or minimize freezing using drying or antifreeze additives; special car designs to prevent or minimize frost penetration; treatment of car and cargo at destination to speed discharge using thawing or mechanical extraction devices. Most published information is related to infra-red car thawing.

Colijn, H  
Canadian Institute of Guided Ground Transport No. 72-13, July 1972, 69 pp, Figs., 20 Ref.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

22 141558

**DETERMINATION OF THE ECONOMIC ORDER QUANTITY UNDER THE CONDITION OF UNCERTAINTY**

The agricultural cooperative plays an important role in most rural regions as a vendor and purchaser of commodities. It is a supplier of transportation services and also a substantial user. This study defines the role of the cooperative in transportation and investigates the potential for agricultural cooperatives to form the nucleus for a transportation company that would integrate the usage of all modes. It is suggested that some easing of the restrictions on regulated carriers to allow intermodal ownership and control could produce improvements in grain distribution patterns to the benefit of carriers, the public and the nation.

Langley, CJ, Jr (Tennessee University, Knoxville) *Transportation Journal* Vol. 16 N Sept. 1976, pp 85-92, 6 Tab.

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DOTL JC

22 142300

**THAWING OF FROZEN BULK GOODS IN WAGONS [Zum Auftauen von in Eisenbahnwagen festgefrorenen Schuettguetern]**

The authors describe the method used in the USSR which combines hot air convection with radiation heating. They also give a calculation model and assess its worth using the example of reheating bauxite. [German]

Henatsch, A *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 22 No. 3, 1975, pp 593-598, 2 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Hochschule fuer Verkehrswesen - Friedrich List - Friedrich List Platz 1, Dresden 801, East Germany

22 142511

**THERMAL CONDUCTIVITY OF BULK ORE CONCENTRATES**

Thermal conductivities were determined for two copper and two zinc sulphide ore concentrates from Noranda Mines. The determinations were carried out by the transient probe method at three temperatures, 5 degrees C and -5 and -15 degrees C, for four moisture contents ranging from 2 to 12 percent. At the lowest moisture content the conductivity of the frozen ore was lower than in the unfrozen state; at higher moisture contents the conductivity of the frozen ore was considerably higher than in the unfrozen state. The thermal conductivity in the frozen state also increased as the temperature was lowered. In most respects the thermal conductivity response of the ores to changes in moisture content, temperature, and density were similar to those of soils. Sieve and hydrometer analysis as well as specific gravity were carried out for characterization of the material. A statistical analysis of the results is included in Appendix A.

Penner, E (National Research Council of Canada)  
Canadian Institute of Guided Ground Transport, (Project No. 3.12.73)  
Final Rpt. CIGGT-76-8, NRC 388, Aug. 1976, 49 pp, 9 Fig., 6 Tab., 4 Ref., 1 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

22 144075

**EFFECTIVE CARRIER MARKETING STRATEGIES: THE CASE OF THE RAILROADS**

Increasingly industry is thinking more in terms of logistics and physical distribution rather than simply having their products transported to customers' warehouses. Railroad marketing should determine which services will maximize the profitability of rail operations involved in a given customer's logistics system. This paper offers insights into ways greater cooperation can be achieved between shippers and railroads. A discussion of results of a survey of shipper logistical needs and ways in which carriers currently do or potentially could respond is included.

Stenger, AJ Beier, FJ *Transportation Journal* Vol. 15 No. 4, June 1976, pp 63-72, 2 Tab.

ORDER FROM: American Society of Traffic and Transportation 547 West Jackson Boulevard, Chicago, Illinois, 60606

DOTL JC

22 147676

**AN EXAMINATION OF THE INLAND TERMINALS APPROACH IN RATIONALIZING THE PRAIRIE GRAIN HANDLING AND TRANSPORTATION SYSTEM**

Since the announcement of the intended construction of a 4.7 million-dollar inland terminal elevator at Weyburn, a great deal of controversy has developed on the subject of the terminal system. The purpose of this report from the University's standpoint, then, was to provide more accurate information and to help people understand the situation. Therefore this report discusses such areas as the economic evaluation of the terminal concept, the feasibility of the terminal from users' point of view, and the evaluation of inland terminals in a system's cost framework. /TRRL/

Kulshreshtha, SN  
Saskatchewan University, Canada No. 266, Apr. 1975, 31 pp, 3 Fig., Tabs., 15 Ref.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada (RTAC02124E), Transport and Road Research Laboratory (IRRD 221622)  
ORDER FROM: Saskatchewan University, Canada Extension Division, Saskatoon, Saskatchewan, Canada

22 147709

**STUDY ON BEER CAN DAMAGE--STRENGTH AND DIMENSIONAL CHARACTERISTICS OF ALUMINUM, TIN PLATE AND TIN FREE STEEL CANS**

The work covered in this report on beer can damage relates to the AAR Research and Test Department program on Lading Damage Research. This report contains the results of tests on aluminum, tin plate and tin free steel beer cans. Sample cans of four different breweries and, where applicable, from different locations of manufacture for a specific brewery, were included in the program. The work consisted of dimensional checks, compression

loading in three different configurations and tensile and hardness tests on the can material.

Guins, SG Olson, LL

Association of American Railroads Technical Center, (Project R-091) Res. Rpt. R-230, July 1976, 23 pp, 10 Fig., 2 Tab., 1 App.

ACKNOWLEDGMENT: Association of American Railroads Technical Center  
ORDER FROM: Association of American Railroads Technical Center 3140 South Federal Street, Chicago, Illinois, 60616

DOTL RP

**22 148267**

**RECOMMENDED PERFORMANCE TEST FOR LOOSE CARGO TRANSPORTED BY TRUCKS AND RAILROADS**

Loose cargo shipped in trucks and railroads encounters dynamic stress due to vibration in trucks, humping in railcars, and shock due to falling. Stress from these causes far exceeds that from other probable sources. Current tests are inadequate to assure the development of an optimum package/product configuration. Excessive package costs or excessive damage results from this inadequacy. Test procedures for realistically evaluating packaged products are presented.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976. See also RRIS 04 148248.

Silver, W (Westinghouse Electric Corporation)  
American Society of Mechanical Engineers Conf Paper Paper D&O-9, 1976, 4 pp

ACKNOWLEDGMENT: EI  
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**22 148268**

**CARGO RESTRAINT CRITERIA FOR RAIL TRANSPORTATION**

The paper discusses criteria for cargo restraint and cargo tiedown for the forces resulting from the rail transportation environment. Methods for calculating the restraint forces for a broad range of cargo railcar combinations are covered. Use of these methods will improve accuracy of restraint criteria, and in turn, will improve reliability of cargo restraints and reduce costs consequent to restraint over design.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976. See also RRIS 04 148248.

Kennedy, R (Transportation Engineering Agency)  
American Society of Mechanical Engineers Conf Paper Paper GP-5, 1976, 6 pp

ACKNOWLEDGMENT: EI  
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23 056949

**COMMUTER RAILROAD FEASIBILITY STUDY ON SELECTED LINES IN THE LOS ANGELES METROPOLITAN AREA**

The objective of the report was to explore feasibility if installing and operating a limited scope rail commuter service over one Southern Pacific and two Santa Fe routes into Los Angeles, California. A package of data is provided including statistical compilations on the operational and physical characteristics of the rail lines under consideration. It is believed possible to inaugurate limited commuter service relatively early, employing Santa Fe trackage on the Santa Ana and Los Angeles route and the San Bernardino-Los Angeles route via Pasadena. Summary of principle statistics of the proposed routes is presented. Findings include annual deficits, projected ridership, marketing aspects, operational and capital costs and implementation of service.

Englund, CRJ

Southern California Association of Governments, (UMTA-CA-09-0022) Final Rpt Jan. 1974, 72p

ACKNOWLEDGMENT: NTIS (PB-231117/3)  
ORDER FROM: NTIS Repr PC, Microfiche

PB-231117/3

23 081194

**BART-I: TRAVELER BEHAVIOR STUDIES. PART III. TRAVEL DEMAND FORECASTING STUDY**

The report summarizes the results of phase one (pre-BART) of the travel demand forecasting study--the collection of pre-BART data from a household survey, with a coordinated collection of data on travel time and costs. Chapters include sample design and field results, the study interview forms, trip report forms, auto travel times for selected trips in the BART service area, and calculation of transit-trip descriptions.

Sponsored in part by Department of Housing and Urban Development, Washington, D.C. See also BART-1, Part 2, Volume 2, PB-236 738, and BART-1, Appendix C, PB-236 740.

McFadden, D

California University, Berkeley, Aspects Techniques Securite Routiere, Department of Transportation Final Rpt. May 1973, 286p

Contract DOT-OS-90023

ACKNOWLEDGMENT: NTIS (PB-236739/9ST)  
ORDER FROM: NTIS Repr. PC, Microfiche

PB-236739/9ST, DOTL NTIS

23 090478

**DESIGN OF PROCEDURES TO EVALUATE TRAVELER RESPONSES TO CHANGES IN TRANSPORTATION SYSTEM SUPPLY. CONFERENCE SUMMARY AND WHITE PAPERS**

The problem addressed arises from the need to develop better techniques for forecasting travel demand. The analysis of transportation system changes through a before change-after impact survey is seen as a means of better understanding the influences on travel behavior and the decisions leading to that behavior. The conference from which these proceedings resulted was held to present and discuss ideas relevant to alternative study designs and data collection methodologies for before change-after impact situations. The papers present different aspects of the central theme. They include long-term, net benefit changes studied by direct demand analysis; types of system changes; attitudinal procedures for short-term, net cost situations; specific change hypotheses and the data requirements involved; and criteria for distinguishing between short-term and long-term supply changes, as well as the criteria for study design of change type.

Prepared in cooperation with Voorhees (Alan M.) and Associates, Inc., McLean, Va., Pratt (R. H.) Associates, Inc., Kensington, Md., and Federal Highway Administration, Washington, D.C.

Ben-Akiva, M Jessiman, WA Manheim, ML Attanucci, JP Deen, TB

Cambridge Systematics, Incorporated, Federal Highway Administration, Voorhees (Alan M) and Associates, Incorporated, Pratt (RH) Associates, Incorporated Sept. 1974, 180 pp

ACKNOWLEDGMENT: NTIS  
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PB-240003/4SL, DOTL NTIS

23 094014

**URBAN TRANSPORTATION INFORMATION HANDBOOK**

This handbook is intended to provide a ready reference tool which offers an initial orientation to the sources of information in the field of urban transportation. It concentrates on sources of information rather than a listing of published research. These sources include: (1) Basic books and reports; (2) bibliography, directories and services; (3) statistics and fact books; (4) periodicals; (5) research organizations, university programs and transportation libraries; (6) industry and professional organizations; (7) conferences; and (8) the government role, a section which contains an overview of the structure and organization of the U.S. Department of Transportation as well as a review of key legislation and legislative processes that operate to develop national transportation policy. A glossary of acronyms is provided.

Fletcher, WS Davis, S

Atlanta University, Urban Mass Transportation Administration, (UMTA-GA-11-0003) Res. Rept. UMTA-GA-11-0003-75-1, Oct. 1975, 202 pp

Contract GA-11-0003

ACKNOWLEDGMENT: NTIS, Federal Highway Administration  
ORDER FROM: NTIS NTIS Price, /MF\$2.25

PB-248391/OST

23 094019

**WISCONSIN STATE RAIL PLAN: THE FUTURE OF WISCONSIN RAIL PASSENGER SERVICE**

The report describes rail service in Wisconsin, presents the attitudes of Wisconsin residents and travelers towards rail transport, and analyzes a number of potential extensions of passenger services.

Wisconsin Department of Transportation, Federal Railroad Administration Nov. 1975, 251 pp

Contract DOT-FR-40025

ACKNOWLEDGMENT: NTIS  
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PB-248620/7ST, DOTL NTIS

23 094168

**FULL COSTS OF URBAN TRANSPORT. PART III. AUTOMOBILE COSTS AND FINAL INTERMODAL COST COMPARISONS**

Contents: Costs, peakload pricing, and optimal service levels for urban expressways; the full costs of an urban work trip--auto versus bus and rail transit. Portions of this document are not fully legible.

See also PB-248 145.

Keeler, TE Merewitz, LA Fisher, P Small, KA

California University, Berkeley, National Science Foundation Monograph-21, NSF/RA/S-75-069C, July 1975, 167 pp

Grant NSF-GI-37181

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS Repr. PC, Microfiche

PB-248147/1ST, DOTL NTIS

23 130767

**SENSITIVITY ANALYSIS OF COMMUNITY SAVINGS DUE TO CHANGE-OF-MODE OPERATIONS**

This study is concerned with a sensitivity analysis of the community savings provided by successful change-of-mode (park-and-ride) facilities in medium to large U.S. cities. The research was an early attempt to generalize the locational aspects of change-of-mode facilities and their benefits to the community. The determination of the community savings due to the diversion of trips from highway to change-of-mode facilities is a prerequisite in assessing the feasibility (success of park-and-ride facilities). Community savings (the summation of both user and nonuser benefits) are computed as the difference in travel costs by highway alone and or by change-of-mode facilities. Travel costs are simulated in a deterministic fashion and by using average unit costs for cities of different sizes and for different locations within a given city. The simulated community savings data are then used to develop a linear multiple regression equation to predict the savings.

Abdus-Samad, UR (National Council for Scientific Research, Lebanon);  
Grecco, WL (Tennessee University, Knoxville) *Transportation Research Record* No. 557, 1975, pp 1-11, 8 fig., 4 Tab., 25 Ref.

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DOTL JC

23 130768

**INFLUENCE OF PARK-AND-RIDE FACTORS IN MODAL SHIFT PLANNING**

The purpose of this paper is to investigate the use of park-and-ride facilities and municipal parking policies as a means of controlling the modal split in urban areas. A discriminant model was used to examine the reasons why park-and-ride patrons shifted to that mode from a former automobile mode. An attitudinal survey was also used to substantiate the model results. The reduction in travel cost appears to be the main reason for the modal shift. The primary conclusion is that a park-and-ride facility can be used as a planning tool to adjust the modal split if the service is properly designed.

Brown, GR (British Columbia University, Canada) *Transportation Research Record* No. 557, 1975, pp 12-20, 4 Fig., 3 Tab., 5 Ref.

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DOTL JC

23 130770

**COMPUTER-ANIMATED SIMULATION MODELS: A TOOL FOR TRANSPORTATION PLANNING**

The role of computer animation in visualizing the behavior of simulation models of complex processes and systems is described. The results of a demonstration project applying this technique to transportation planning are reported and analyzed. The study involved the modeling and display of passenger flow in a subway station. It was carried out by using SIMULOGO, a new discrete-event simulation language, and ZAPP, a new computer animation system, which are discussed in the paper. Planned extensions and elaborations of these facilities to provide a comprehensive and responsive environment for transportation systems modeling are outlined.

Baecker, RM Horsley, TR (Toronto University, Canada) *Transportation Research Record* No. 557, 1975, pp 33-44, 4 Fig., 19 Ref.

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DOTL JC

23 133287

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES. STATION PLANNING**

The project was designed to develop a revised and updated series of handbooks covering various aspects of the design, construction, and equipment of a modern rail rapid transit system. This volume covers station planning.

Prepared in cooperation with Tri-State Regional Planning Commission, New York. Paper copy also available in set of 12 reports as PB-251 641-SET, PC\$70.00.

New York City Transit Authority, Urban Mass Transportation Administration, Tri-State Transportation Commission, (UMTA-IT-09-0014-TS-C) Tech. Rpt. UMTA-IT-09-0014-75-2, Mar. 1975, 72 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-251643/3ST, DOTL NTIS

23 134679

**CRITICAL DECISIONS IN THE RAPID TRANSIT PLANNING PROCESS**

This paper shows how financial, attitudinal, and physical factors influence decisions on whether to build a rapid transit facility and how much to build. The authors discuss the need for a more rigorous planning process that will discriminate among projects considered for financial assistance. They note the inadequacies of aggregate criteria and suggest that cost per passenger mile (kilometer) is a useful but incomplete measure. Results of benefit-cost analysis for major systems are compared, and specifications are suggested to increase the usefulness of such an analysis. Standardized estimates of benefits and costs, although inadequate in isolation, can make a useful contribution to the analysis process.

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Deen, TB Kulash, WM Baker, SE (Voorhees (Alan M) and Associates, Incorporated) *Transportation Research Record* No. 559, 1975, pp 33-43, 4 Fig., 6 Tab., 12 Ref.

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23 134680

**EVALUATION OF RAIL RAPID TRANSIT AND EXPRESS BUS SERVICE IN THE URBAN COMMUTER MARKET**

The basic alternative transportation modes in the urban commuter market, which are bus and rail transit, are covered in this paper. Comparing these alternatives on the basis of full cost, which includes supplier cost (costs for vehicle, way, and structure) and user-time cost (costs for access, waiting, in-vehicle transfer, and egress time), is dealt with. A modern rail rapid transit line has about the same passenger-carrying capacity as a bus system has if the bus system uses an exclusive busway for line-haul and surface streets for downtown distribution. The levels of user-time cost for a modern rail rapid transit line are equivalent to those for a bus system, but the supplier costs are much higher for rail rapid transit. Lower full cost can be achieved for low-density, short-haul residential collection if 8-passenger bus-wagon jitneys are used instead of 50-passenger buses.

Boyd, JH (Motor Vehicle Manufacturers Association); Asher, NJ (Institute for Defense Analyses); Wetzler, ES (Econ, Incorporated) *Transportation Research Record* No. 559, 1975, p 44-50, 9 Ref.

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23 134681

**COMPARATIVE ANALYSIS AND SELECTION OF TRANSIT MODES**

Current planning of transit systems in many cities requires comprehensive comparisons of alternative transit modes. This paper reviews the state of the art. Important conceptual studies and successful, practical mode comparisons for several cities are pointed out. Serious deficiencies of studies using hypothetical situations and comparing modes through costs only are shown on a diagram typically used in these studies. Methodology for mode evaluation consisting of several steps is presented. Requirements of passengers, operator, and community are defined; then candidate modes are selected through type of right-of-way, technology, and operation. Each mode then is evaluated in terms of monetary costs, other quantitative units, and qualitative values. A summary of the procedure also is presented.

Vuchic, VR (Pennsylvania University, Philadelphia) *Transportation Research Record* No. 559, 1975, pp 51-62, 3 Fig., 4 Tab., 13 Ref.

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23 134685

**COMPARATIVE ANALYSIS OF URBAN TRANSPORTATION COSTS**

This paper develops the methodology and compares door-to-door trip characteristics of some urban transportation modal combinations that are currently in use, are being considered, or appear to hold near-term promise for corridor travel in large U.S. cities oriented to the central business district. The cost and travel time of various options are developed separately for residential line-haul, and downtown trip components. Then they are combined selectively to explore relative merits of door-to-door alternatives. The analysis addresses the many possible variations in corridor length, central business district size, daily volume level, and temporal flow pattern. Furthermore, the sensitivity of costs with respect to changes in design specifications, operating policy, automation, and nature of construction is explored. A case study compares various options for Metro in the Washington, D.C., metropolitan area. The marginal costs of busway-based systems are lower than those of systems based on rail rapid transit. Automation is not likely to lower rail rapid transit operating costs dramatically. High-performance, exclusive busways require substantial initial investment but are less costly and faster than rail rapid transit in almost all environments and volume levels. Residential collection with jitneys costs only a little more than residential collection with buses and provides much better service. Car pools provide the least expensive service and attractive door-to-door time.

Bhatt, K (Urban Institute) *Transportation Research Record* No. 559, 1975, pp 101-125, 9 Fig., 10 Tab., 13 Ref.

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23 136410

**WHEN TO USE MULTIPLE-UNIT CARS OR LOCOMOTIVES**

The use of electric locomotive-hauled trains vs. electric multiple-unit trains in both commuter and intercity service is analyzed with respect to economic considerations. Available cost factors are presented. Other conditions whose costs must be individually developed are identified. Warning is given that each proposed application must be analyzed in the light of all conditions peculiar to it.

Presented at the Am Transit Assoc Rail Transit Conf., San Francisco, Calif., Apr. 14 and 16, 1974, Car Equip Sess. NTIS Nos. PB-234

Vollmar, JR (Klauder (Louis T) and Associates)

American Transit Association ATA/RT-74/1.2,3, 1974, pp 50-75

ACKNOWLEDGMENT: EI

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23 136413

**RELIABILITY AND AVAILABILITY ASSESSMENT CRITERIA, DATA INPUTS AND ANALYSIS METHODS FOR MASS TRANSIT SYSTEMS**

The availability and reliability of a mass transit system is analyzed and assessed, and a fairly complete list of criteria for judging these characteristics of a mass transit system is presented. A discussion is also included of the analysis and data reduction methods involved and an interpretation is given of the resulting numerics noting the particular aspect of reliability or availability addressed by each within the context of previously determined management goals.

Presented at the Annual Reliab Maintainability Symp., Las Vegas, Nev., Jan. 20-22, 1976 sponsored by ASME and IEEE.

Welker, EL (TRW, Incorporated)

Institute of Electrical and Electronics Engineers Proc Paper No. 1370, 1976, pp 390-313, 2 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

23 136414

**FUJITSU AUTOMATIC PASSENGER INFORMATION SYSTEM (FAPIS)**

Described is the fully automated system for Sanyo Shinkansen train service. Minicomputers installed in every station are connected to the COMTRAC (COMputer aided TRAffic Control) to provide automatic control of the display panel and announcement service for passengers. The system also informs waiting passengers of the status of delayed trains. This paper outlines this system and its application in the future.

Ahimura, T Kuboki, I Nomoto, Y *Fujitsu Scientific and Technical Journal* Vol. 11 No. 4, Dec. 1975, pp 21-31

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

23 136974

**THE CONSEQUENCES OF TRANSIT FARE AND SERVICE POLICIES: A CLASSIFIED BIBLIOGRAPHY**

The bibliography is concerned with the consequences--most specifically the ridership and cost implications--of various policies regarding service and fare levels for urban public transit. Cited publications are classified under separate headings for ease in reference. These are: the demand for transit service; fare and service elasticities of demand; transit operating costs; the economics of transit pricing; public subsidies for transit operations; low-fare and no-fare transit; transit fare structures; transit fare and the distribution of income; transit and the transportation disadvantaged; transit planning, operation and evaluation; marketing transit; and general reference material.

Kemp, MA Rea, RL

Urban Institute, Urban Mass Transportation Administration, (UMTA-DC-06-0120) Working Paper-505012, UMTA-DC-06-0120-76-3, Apr. 1976, 40 pp

Contract DC-06-0120

ACKNOWLEDGMENT: NTIS

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PB-253101/OST, DOTL NTIS

23 136994

**NORTHEAST CORRIDOR RAIL STATIONS. TASK 13. PROTOTYPE BELTWAY STATION DEVELOPMENT. NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROGRAM**

The Northeast Corridor Project within the Federal Railroad Administration of the Department of Transportation had its foremost objective the development planning, physical design and subsequent implementation of high speed intercity rail passenger service between Washington D.C. and Boston, Massachusetts. This would include the renovation, expansion or new construction of 15 stations along the Northeast Corridor. This project was defined to develop planning and design requirements and prepare alternative designs for a prototype beltway (low activity level) intercity rail passenger station, select optimized design and develop a site-specific station work package.

Cambridge Seven Associates, Incorporated, Federal Railroad Administration Final Rpt. FRA/ONECD-76/13, May 1976, 185 pp

Contract DOT-FR-40029

ACKNOWLEDGMENT: NTIS

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PB-253593/8ST, DOTL NTIS

23 137038

**CRITERIA FOR EVALUATING ALTERNATIVE TRANSIT STATION DESIGNS**

The urban transit interchange facility is described in terms of the important functional facility components and the quality of the station environment. These terminal dimensions are interpreted to establish a list of design objectives which reflect the points of view of the user, the special user (elderly and handicapped) and the operator. The stated objectives are then used to identify criteria for the evaluation of alternative urban transportation interface facility designs. A general evaluation is derived and compared with the basic systems evaluation procedures: effectiveness analysis, benefit-cost analysis, and ranking and rating models. A terminal facility evaluation model with a specific set of measureable criteria is described with respect to three primary areas of application; i.e., a set of mutually exclusive project designs, an iterative design process, and the analysis of a major design strategy (e.g., modular construction).

Hoel, LA Demetsky, MJ Virkler, MR

Virginia University, Department of Transportation Intrm Rpt. RLES-CE-4142-101-76, DOT/TST-76/68, Feb. 1976, 62 pp

Contract DOT-OS-50233

ACKNOWLEDGMENT: NTIS

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PB-253742/1ST, DOTL NTIS

23 137052

**MACRO-ANALYSIS OF SHORT-HAUL TRANSPORTATION**

The report summarizes the findings of a study in support of the Short-Haul Transportation Analysis for Research and Development (STAR Study) for the Department of Transportation. The purpose of the overall STAR Study was to assist the Office of the Secretary of Transportation/Assistant Secretary for Systems Development and Technology (OST/TST) in evaluating and formulating its research and development policies toward short-haul intercity transportation. The study developed a methodology for evaluating the trade-offs which must be made between and within modes as a means of arriving at an approximation of the best answers and applied the methodology to macro-economic, demographic and transportation data to arrive at preliminary selections of best systems.

Little (Arthur D), Incorporated, Department of Transportation Final Rpt. DOT/TST-76-75, Oct. 1971, 211 pp

Contract DOT-OS-10199

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254402/1ST, DOTL NTIS

23 137313

**RAIL TRANSIT SYSTEM COST STUDY**

The Transportation Systems Center serves as Systems Manager for the Rail Supporting Technology Program of the Urban Mass Transportation Administration. One task under this program has been to assess the costs of constructing, operating and maintaining three kinds of urban rail systems: light rail, rapid rail and commuter rail. Cost data from several North American and European transit authorities were collected and analyzed. These data, together with the recent experience of the Consultant in several transit construction projects, served as the basis of the cost projections. Factors influencing appreciable cost variations in construction and operations were reviewed and included as criteria for cost projections.

Dyer, TK Hale, WK Ingalls, FA Whelan, RB  
Dyer (Thomas K), Incorporated, Urban Mass Transportation  
Administration, Transportation Systems Center Final Rpt. UMTA-MA-06-0025-76-3, Jan. 1976, 117 pp

Contract DOT-TSC-808

ACKNOWLEDGMENT: NTIS

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PB-254627/3ST, DOTL NTIS

23 137340

**ALLOCATION OF RESOURCES FOR TERMINAL IMPROVEMENT**

The report describes the development of a resource-allocation model developed for the improvement of the internal environment of transport terminals. It incorporates considerations of comfort, cost, and patron opinion to allocate resources for maximum effect and efficiency.

Cantilli, EJ  
Polytechnic Institute of New York, Urban Mass Transportation  
Administration, (UMTA-NY-11-0009) UMTA-NY-11-0009-75-2, Dec.  
1975, 118 pp

ACKNOWLEDGMENT: NTIS

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PB-254811/3ST, DOTL NTIS

23 137360

**MACROANALYSIS OF THE IMPLICATIONS OF MAJOR MODAL SHIFTS IN INTEGRATED REGIONAL TRANSPORTATION NETWORKS**

The report describes a macroanalytic approach to the problem of analyzing changing travel patterns in an integrated regionwide transportation network. Separate models of residential areas, transportation corridors, and central business districts are combined in a modular representation of urban structure suitable for use in policy analysis and transportation planning. This analytic approach treats demand parametrically, has minimal data requirements, and provides rapid insights into the impacts of alternative patterns of transit and automobile usage. Such impacts as travel time, user costs, congestion, and energy consumption are examined explicitly. Application examples discuss the potential economies of scale available from major shifts in current transit usage patterns, tradeoffs between flexible-route and fixed-route systems, and the potential benefits available from policies to reduce the effects of demand peaking.

Billheimer, JW Bullemer, R Holoszyc, M  
Systan, Incorporated, Department of Transportation Summ. Rpt. System-D147, DOT/TST-76-64, Apr. 1976, 42 pp

Contract DOT-OS-50265

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254923/6ST, DOTL NTIS

23 137368

**NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROGRAM. FINAL MARKETING REPORT FOR THE NORTHEAST CORRIDOR RAIL PASSENGER DEMONSTRATION**

The report analyses the impact on the North East Corridor passenger transportation system of the High Speed Ground Demonstration Program, and, on the basis of the findings from the analysis, considers alternative marketing strategies for the future, and selects the strategy that offers the most favorable outcome.

See also PB-255018.

Transmark, London, Federal Railroad Administration Final Rpt. FRA/-NECPO-76/07-1, Apr. 1976, 88 pp

Contract DOT-FR-55048

ACKNOWLEDGMENT: NTIS

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PB-255017/6ST, DOTL NTIS

23 137369

**NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROGRAM. FINAL MARKETING REPORT FOR THE NORTHEAST CORRIDOR RAIL PASSENGER DEMONSTRATION-TECHNICAL APPENDIX**

The report evaluates the likely passenger market affected by the offering of improved rail service in the Northeast Corridor, and develops recommendations for marketing strategies intended to enhance patronage growth.

See also PB-255017.

Transmark, London, Federal Railroad Administration Final Rpt. FRA/-NECPO-76/07-2, Apr. 1976, 68 pp

Contract DOT-FR-55048

ACKNOWLEDGMENT: NTIS

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PB-255018/4ST, DOTL NTIS

23 137406

**ANALYSIS OF MAJOR SHORT-HAUL TRANSPORTATION PROBLEMS**

The report examines five major problems in short-haul transportation: break-even analysis, noise, energy, air pollution, and safety. The break-even analysis is applied to both new and existing ground and air systems including TACV, improved rail, autotrain, bus, CTOL, VTOL, and STOL. The noise analysis includes a survey of existing transportation noise impacts, as well as a noise mapping analysis of proposed passenger systems. The noise chapter identifies R&D opportunities and makes recommendations on governmental noise policy. The energy chapter examines energy resources, consumption, and transportation energy efficiencies, and identifies R&D opportunities with particular emphasis on transportation-related opportunities. The air pollution chapter compares current and forecast future emission levels for three modes: TACV, automobile, and CTOL. Transportation safety is examined historically in terms of highway, rail, and aviation safety, and R&D opportunities are identified.

Rogstad, B Berterman, J Dobson, A Grainger, G O'Leary, K  
PRC Systems Sciences Company, Department of Transportation Final  
Rpt. DOT/TST-76-76, Nov. 1971, 211 pp

Contract DOT-OS-10197

ACKNOWLEDGMENT: NTIS

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PB-254758/6ST, DOTL NTIS

23 137414

**RAIL PASSENGER STATISTICS IN THE NORTHEAST CORRIDOR 1974-75**

The monthly data for the years 1974 and 1975 reflect different aspects of train ridership on the Northeast Corridor. In 1974 patronage was substantially higher than it was in 1973 due to the fear that there would be no gasoline available when needed during an intercity automobile trip. In 1975 this fear had subsided, and although generally the number of passengers were higher than had been the case in 1973, the patronage figures were lower than the 1974 high.

Winstone, RL  
Federal Railroad Administration Mar. 1976, 64 pp

ACKNOWLEDGMENT: NTIS  
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PB-255064/8ST, DOTL NTIS

23 138139

## ASSESSING THE ARGUMENTS FOR URBAN TRANSIT OPERATING SUBSIDIES

Operating subsidies to urban transit have been growing rapidly in recent years. In the near future they will probably pay one-third or more of the industry's operating expenses. Proponents argue that operating subsidies are desirable because (a) they alleviate problems with existing automobile and land use patterns (such as congestion, air pollution, energy consumption, and urban sprawl); (b) they create a more egalitarian distribution of income and mobility; and (c) they permit public transit to be priced at its marginal cost. Unfortunately, many of the arguments of subsidy proponents are implausible. The most plausible argument is not that operating subsidies should be used indiscriminately, but that they should be used to support only particular types of public transportation service. Local transportation authorities currently do not restrict their fare reductions to the appropriate types of service, and they are not likely to do so in the future.

Presented at the 54th Annual Meeting of the Transportation Research Board.

Gomez-Ibanez, JA (Harvard Business School) *Transportation Research Record* No. 573, 1976, pp 1-11, 14 Ref.

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23 138148

## CHARACTERISTICS, ATTITUDES, AND PERCEPTIONS OF TRANSIT NONUSERS IN THE ATLANTA REGION

Immediately after transit fares in Atlanta were reduced, transit ridership increased dramatically, exceeding the previous estimates by 50 percent. Total ridership for the 6-month period following the March 1, 1972, fare reduction was almost 15 percent greater than that for the equivalent period in 1971. The fare reduction program of the Metropolitan Atlanta Rapid Transit Authority (MARTA) generated considerable local and national interest, and research was designed to measure the effect of the fare reduction and subsequent transit service improvements on ridership. The study effort consisted of two surveys: (a) an on-board interview of transit riders and (b) an in-home survey of households in the two-county transit service district. This paper deals exclusively with the in-home survey. The MARTA in-home survey dealt with two principal areas of inquiry to complement the on-board survey findings. The first area consisted of the characteristics of transit nonusers as well as their attitudes toward and perceptions of transit. In addition, the in-home survey was designed to determine whether the characteristics, attitudes, and perceptions of nonusers were significantly different from those of transit users. The second area dealt with why the increase in ridership was not even higher and what actions would be necessary to attract additional riders.

Report prepared for the 54th Annual Meeting of the Transportation Research Board.

Byrd, JP, IV (Metropolitan Atlanta Rapid Transit Authority) *Transportation Research Record* No. 563, 1976, pp 29-37, 9 Tab.

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23 138149

## TRAVEL PATTERNS ON A NEW REGIONAL RAPID TRANSIT SYSTEM: CLUES FROM THE EARLY STAGES OF OPERATIONS ON BART

This paper reports on some of the traffic patterns that developed on the Bay Area Rapid Transit (BART) System from November 1973 to August 1974, when only portions of the BART network were open to traffic. Data from fare gates at stations, counts on trains, transfer tickets, and highway traffic counts were compared to BART estimates made in 1971. Indications are that BART will attract far fewer short trips (less than 6 miles or 10 km) in San Francisco and Oakland than had been anticipated. Short trips in some outer areas with less surface transit and trips greater than 10 miles (16 km) long may have been underestimated. This suggests that the forecast

inaccurately evaluated submodal split between rail and bus transit over short distances and may have weighted cost differentials too highly for long trips. On peak shopping days, BART attracts shoppers to downtown areas and to regional shopping centers near BART stations, BART is quite successful in attracting those who commute to industrial and commercial areas and to universities outside downtown areas who use feeder buses at their trip ends. In one corridor BART appears to have caused an increase in total transit use, partly by diverting travelers from the automobile and partly by generating new trips. When a surface transit system in BART territory ceases to operate, some additional short trips are made on BART, but there is a loss of longer trips that used feeder buses.

Report prepared for the 54th Annual Meeting of the Transportation Research Board.

Homburger, WS (California University, Berkeley) *Transportation Research Record* No. 563, 1976, pp 38-52, 1 Fig., 8 Tab., 3 Ref.

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23 139490

## THE RESURGENCE OF LIGHT RAIL TRANSIT

With the development of a new Standard Light Rail Vehicle there has been an increased interest in light rail systems for community mass transit. Light Rail Transit systems can be tailored to the needs of communities having too many passengers for successful busing and too few for an elaborate metro system. Existing systems, ranging from street running lines to private right-of-way cars, illustrate the diverse roles possible. Among many uses for the intermediate capacity light rail systems are: off loading subways; feeding and cross-connecting areas to subways, light car service for initial use on lines expected to grow to metro status; supporting special products such as entertainment centers.

Lenow, M *ASCE Journal of Transportation Engineering* Vol. 102 No. TE2, No. 12131, May 1976, pp 229-242

ACKNOWLEDGMENT: EI

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DOTL JC

23 139511

## COMPUTER SIMULATION OF A SMALL RAILROAD SYSTEM FOR OPTIMAL PASSENGER SERVICE WITH MINIMAL CAPITAL INVESTMENT

The current railroad system in Taiwan consists of a major railroad about 411 kilometers in length along the populous west coast, with some minor railroads spreading over the island. The major part of the land transportation on the island is served by this railroad which connects all the seven largest cities and the two major seaports and all the significant industrial centers of Taiwan. Operations statistics show that the railroad utilization is among the highest in the world. A simulation study of the Taiwan railroad system is reported. Three alternatives were simulated. Problem description, reasons for simulation, simulation objectives, language selection, data collection and model development, simulation results, and conclusion are presented.

Simulation Symposium, 8th Annual, Record of Proceedings, Tampa, March 12-14, 1975.

Shen, SNT Kang, ANC Kang CK

Institute of Electrical and Electronics Engineers 1975, pp 171-179, 4 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: IEEE

N 75CHO-984-5C

23 139529

## THE ECONOMIC USE OF SUBSIDIES FOR URBAN MASS TRANSPORTATION

The energy crisis and various urban problems stemming from auto congestion, pollution, and the cost of providing public highways have created enormous interest in revitalizing our urban mass transit systems. Currently much is being said and written regarding the efficacy of granting federal, state and/or local operating subsidies. In this article, the author reviews the transit industry's peak capacity problem, and questions the economic wisdom of providing operating subsidies, subsidies, as some are now being provided, and how most will probably be administered in the near future. An



alternative plan suggests the manner in which subsidies can eventually help the transit industry. The article concludes with an analysis of what research efforts are needed in many urban transit systems and how subsidies can be used to support such research.

Mundy, RA *Transportation (Netherlands)* Vol. 5 No. 2, June 1976, pp 123-133

ACKNOWLEDGMENT: UIC

ORDER FROM: Elsevier Scientific Publishing Company P.O. Box 211, Amsterdam, Netherlands

### 23 139534

**EASTERN EUROPE LEADS IN TRAMCAR STANDARDISATION**  
With more than 60% of the urban tramway systems concentrated in the USSR and Eastern Europe, there is considerable scope for widespread standardization of tramcars. The author describes how progress in standardization has been achieved through strong central planning. Czechoslovakia and the USSR now supply 90% of all tramcars for East European undertakings.

Taplin, M *Railway Gazette International* Vol. 123 No. 7, July 1976, p 255, 4 Fig., 8 Phot.

ACKNOWLEDGMENT: UIC

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DOTL JC

### 23 139535

#### DUTCH CITIES BEGIN TO DEVELOP THE TRAM

A long period of decline eliminated trams from all but the three principal cities of Holland, but these networks are now being expanded and Utrecht is planning a new line. The tram is seen as a much cheaper alternative to the heavy metro, but more important is the way better management of street traffic to give trams priority is slowly tipping the balance against competing private transport. Trams have a higher passenger/crew ratio than buses.

Saher, WFK *Railway Gazette International* Vol. 132 No. 7, July 1976, p 259, 3 Fig., 4 Phot.

ACKNOWLEDGMENT: UIC

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### 23 139536

#### EDMONTON AT THE HALF-WAY STAGE

While the discussion and planning for proposed light rapid transit networks continues in many North American cities, Edmonton has gone ahead with construction and its initial 7 km route is due to open in early-1978. The simplicity of the line with its eight grade crossings and use of CN rights-of-way is noted and a brief description of rolling stock is included.

MacDonald, DL *Railway Gazette International* Vol. 132 No. 7, July 1976, p 253, 1 Fig., 4 Phot.

ACKNOWLEDGMENT: UIC

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### 23 141296

#### STRUCTURAL TRAVEL DEMAND MODELS: AN INTERCITY APPLICATION

Conventional sequential transportation models clearly have limitations as estimators of intercity travel demand. Despite their theoretical advantage, little work has been carried out in the full application of behavioral or "structural" models. Structural-model development is focused primarily on disaggregate models, particularly for modal split. This paper discusses the development of an alternative approach, that of developing a set of direct-demand models for estimating intercity transit travel for a Sacramento-Stockton-San Francisco Bay Area corridor study. A series of judgments are desired that identify why structural models rather than sequential models were chosen and why direct-demand models rather than probabalistic-choice models were used. The methodology of calibration, including variable selection and equation development, validation, and forecasting, is outlined. Emphasis is placed on the trade-offs to be made among policy responsiveness, accuracy, and the practical problems of developing and using such forecasting tools. The material has been oriented

toward the planner-engineer faced with the practical issues of selecting and using intercity travel demand forecasting procedures.

Peers, JB Bevilacqua, M (Voorhees (Alan M) and Associates, Incorporated) *Transportation Research Record* No. 569, 1976, pp 124-135, 7 Tab., 6 Ref.

ORDER FROM: TRB Publications Off

### 23 141379

#### SEVEN YEARS OF TRAIN-AIR COMPETITION IN THE NEW YORK TO WASHINGTON PASSENGER MARKET

A total of 21.1 million passenger trips were made in the seven years by both the Metroliner and air service on the Washington-New York/Newark city pair. The Air carriers accounted for 70.0 percent of the total or 14.8 million trips, but the proportion of rail passengers increased from 24.8 in 1969 to 39.3 percent in 1975, while the air percentage fell from 75.2 in 1969 to 60.7 percent in 1975. Significant competition is noted between Metroliner and air service. A special week-end air coach excursion fare has not shown any pronounced increases in ridership. In March 1975, Amtrak instituted an off-peak round trip coach fare, and a new marketing concept involving replacement of old equipment, at the end of 1975, 15 metroliners and 38 conventional trains were operating in each direction. It is noted that a combination of factors such as increased rail and air fares, the return of people to their automobiles, and the poor economic conditions account for the decreased number of common carrier patrons.

Winestone, RL

Federal Railroad Administration May 1976, 22 pp, Tabs.

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### 23 141380

#### EXAMINATION OF NINE YEARS OF TRAIN-AIR DATA IN THE BOSTON TO NEW YORK PASSENGER MARKET

Rail passenger data collected over a period of nine years are compared with commercial air carriage in intercity service between Boston and New York. Air carrier passengers were 85.8 percent of the nine-year total air-rail passenger trips, but the proportion of rail passengers more than doubled from an average of 12.2 in 1971 to 26.4 percent in 1975. Air patronage has slipped from 87.8 to 73.6 percent in the same period. Statistics also show that the number of rail riders was smaller in 1976 than it was in 1974, falling for the first time since 1971. Amtrak's effort to attract passengers is noted, and economic conditions are cited as reason for the total decreased ridership. A week-end Air Shuttle fair and an off-peak Amtrak excursion fare are expected to attract riders to the respective modes in 1976.

Winestone, RL

Federal Railroad Administration May 1976, 24 pp, Tabs.

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### 23 141444

#### ECMT ROUND TABLE 30(22-23 MAY 1975). THE VALUE OF THE TIME [CEMT Table ronde 30 (22-23 Mai 1975). Valeur du temps]

The report is a critical survey of methods proposed by various authors to assess the time spent in travelling as a definite value which it would be possible to introduce into econometric calculations without incompatibility. The report is followed by a summary of the discussions resulting from it. [French]

Goodwin, PB

European Conference of Ministers of Transport Conf. Proc 1976, 64 p, 12 Tab., 67 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Organization for Economic Cooperation and Devel Suite 1207, 1750 Pennsylvania Avenue, NW, Washington, D.C., 20006

### 23 141499

#### METHODOLOGICAL FORMULATIONS FOR AN OPTIMIZATION OF RAILWAY LONG DISTANCE PASSENGER TRANSPORT

An improvement in the handling of long-distance passenger traffic by rail mainly depends on the structure of the network and on the timetable constraints. The present paper (apart from discussing the general problems inherent in the solution of combinatory optimization tasks in transport

technology) deals with the methodological conditions affecting the optimum pattern of routes and its realisation with the aid of a branch-and-bound method. The following optimisation criteria are taken into account: economic efficiency of the networks by aligning the routes along minimum resistance paths and limitation of the number of routes to a minimum value resulting from the flow of passengers; enhancing the attraction of the services on offer by enabling a maximum number of passengers to make use of through facilities. /TRRL/

Pierick, K Wiegand, K (Brunswick Technical University) *Rail International* No. 6, June 1976, pp 328-34, 5 Fig., 3 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220951)

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23 141500

### SINGLE TRACK WORKING

This paper examines the possibility of employing sections of single track for two-way operation of autotrams and metros in urban areas. A comparison between head-on and alternate operation, shows the former to be preferable for routes with long links and short waiting times. Alternate operation is advantageous when the link transit time is the same or only slightly more than the waiting time and a high frequency service is desired, and when the mean journey length is short. A cost analysis shows that for routes with moderate passenger flows, elevated or tunnelled track and reasonably even and close station spacings, substantial overall cost savings can be achieved with a single track system. /TRRL/

Gillie, RF

Warwick University, Lanchester Polytechnic No. 27, Working Paper 27, Feb. 1976, 21 pp, 13 Fig.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 220816)

ORDER FROM: Warwick University Urban Transport Research Group, Coventry, England

23 141647

**RAIL LINKS TO AIRPORTS THROUGHOUT THE WORLD [Les liaisons rail-aerports dans le monde]**  
No Abstract. [French]

Rolland, P *La Vie du Rail* No. 1545, 760530, pp 42-49, 7 Fig., 4 Tab.

ACKNOWLEDGMENT: UIC

ORDER FROM: French National Railways 610 Fifth Avenue, New York, New York, 10020

23 141648

**THE EFFECTS OF THE "SHINKANSEN," AND ESPECIALLY ITS EXTENSION TO FUKUOKA, ON AIR TRANSPORT IN JAPAN [L'impact du "Shinkansen" et principalement de son extension jusqu'à Fukuoka-sur le transport aerien au Japon]**  
No Abstract. [French]

Kenshi, Y *ITA Bulletin* No. 23, June 1976, pp 543-548, 2 Fig., 4 Tab.

ACKNOWLEDGMENT: UIC

ORDER FROM: Institut du Transport Aerien 4 rue de Solferino, Paris (7e), France

23 141684

### SKIP-STOP OPERATION: HIGH SPEED WITH GOOD AREA COVERAGE

Increase of transit speeds is one of the most effective ways for increasing the attractiveness of transit for urban travel. For longer trips, particularly where there is a competing freeway, the requirement for speed is rather high. With frequent stations, high operating speeds cannot be achieved. This article describes the main alternative solutions to this problem and then focuses on the skip-stop operation, presenting a methodology for its analysis and evaluation. The article refers to rail services, but the basic aspects of the problem are common for any technology. Light rail and bus services for which skip-stop service could be considered could use the methodology developed.

The article is a revision of that published in *Traffic Quarterly*, Vol. 27, No.

2 (April 1973); research was partially funded by UMTA, DOT.

Vuchic, VR (Pennsylvania University, Philadelphia) *Union Internationale des Transports Publics, Revue* Vol. 25 No. 2, 1976, pp 114-120, 2 Tab., 6 Ref., 1 App.

ORDER FROM: International Union of Public Transport Avenue de l'Uruguay 19, B-1050 Brussels, Belgium

23 142258

### TICKET ISSUING AND INSPECTION SYSTEM IN JNR

RTRI of JNR has developed various types of ticket issuing and inspection machines, such as ticket vending machine, printing/issuing machine, data collecting machine and automatic ticket inspection gate. For the automatic ticket inspection system, RTRI also developed a standard ticket testing device which is very useful not only for JNR but also for private railways. These developments must, in parallel with technological progress, reflect the trends of human society and must adapt to new kinds of software.

Maruyama, H Kageyama, N

Railway Technical Research Institute Quart Rpt. Vol. 17 No. 2, 1976, pp 49-53, 7 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Technical Research Institute

ORDER FROM: Japanese National Railways Kunitachi, Box 9, Tokyo, Japan  
DOTL JC

23 142270

### COST MINIMIZING POSITIONS, LENGTHS AND HEADWAYS FOR PARALLEL PUBLIC TRANSIT LINES HAVING DIFFERENT SPEEDS

A model of a transit system is built to find for parallel lines in a rectangular city the lengths, positions, and headways which minimize user (travel time) and operating costs in response to a general population density function and differing line speeds. It is found that, at some point, low speed lines should be cut off, this point depending upon the relative positions, headways and speeds of adjacent lines. Further, it is found that the optimum position depends upon the tributary population and the changes in operating cost and the change in operating cost due to changes in headway.

Byrne, BF (West Virginia University) *Transportation Research* Vol. 10 No. 3, June 1976, pp 209-214, 9 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

23 142285

### THE OPTIMAL ECONOMIC SPEED FOR RAIL PASSENGER TRAFFIC

In an article in vol. 1/2, 1975, of the ETR, the author reported on a study commissioned by the UIC planning committee and carried out by representatives of those European railways which are either building or planning high-speed routes. In the present article the author shows mathematically that the assumptions on the influence of speed-dependent cost elements and on profitability per passenger-kilometre are correct, and also why the stated premises should not be regarded as restricting the general validity of the results of the study. [German]

Brettmann, E *Eisenbahntechnische Rundschau* Vol. 25 No. 5, May 1976, 5 pp

ACKNOWLEDGMENT: British Railways Board

ORDER FROM: Hestra-Verlag Holzhofallee 33, 61 Darmstadt, West Germany

DOTL JC

23 142297

### SOCIO-ECONOMIC VARIABLE FORMS FOR TRANSPORTATION DEMAND PREDICTION

The study suggests the use of three statistical procedures for formulating the demand model, based on functional forms of variables that most significantly express the travel demand relationship. The best functional form of the pairing-like variable is defined as the one which will yield a statistically sound model of travel estimation, as indicated by stepwise multiple regression techniques. It is anticipated that by incorporating these variable forms, the predictive power of resulting travel demand models will be

substantially improved, while data requirements are minimized. These suggested procedures for evaluating alternative variable forms should achieve their validity over a wide range of applications in any gravitational model for intercity travel demand estimation.

Presented at the 1976 IEEE Region 6 (Western USA) Conference in Salt Lake City, Utah, May 7-9 1975.

Yu, JC (Utah University) *Institute of Electrical and Electronics Engrs Proc*  
Proceeding 75CH0952-2, Reg 6, 1975, p 157

ACKNOWLEDGMENT: EI  
ORDER FROM: IEEE

### 23 142600 HIGH-SPEED PASSENGER TRAFFIC

This textbook contains the following chapters: (1) Basic Prerequisites for High-Speed Operation of Passenger Trains; (2) Development of Passenger Traffic in the USSR; Plan and Design of High-Speed Railroad Lines; (3) Planning and Design of High-Speed Railroad Lines; (4) Design Features and Track Maintenance of High-Speed Traffic; (5) Rolling Stock for High-Speed Passenger Trains; (6) Braking Technology for Rolling Stock; (7) Aerodynamic Testing of Rolling Stock; (8) Power Supply for High-Speed Electrified Lines; (9) Automation of Traffic Control on High-Speed Lines; (10) Construction and Operating Problems of Special High-Speed Lines.

Table of Contents only translated in English, original untranslated as of November 1976.

Transport Publishing House Textbook No Date, 5 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

### 23 142605 METHODOLOGY OF THE SELECTION OF THE OPTIMUM VARIANT FOR THE RECONSTRUCTION OF LINES FOR PASSENGER RAILROAD TRAFFIC AT SPEEDS OF 200 KM/HR

Preparation of existing rail lines for projected high-speed passenger trains is based initially on technical and economic analyses of the rebuilding of segments which represent major speed restrictions. Among the factors appraised are: Radius of curvature, nature of straight segments between successive curves, motive power and traction characteristics, braking performance, train characteristics and the varying types of trains which must use the line. Train categories are high-speed passenger (200 km/hr), fast passenger (160 km/hr), suburban (130 km/hr) and freight (100 km/hr). Formulas are given for summation of the physical and economic factors on which decisions are reached.

Translated in draft form.

All-Union Labor Red Banner Railway Research Inst No Date, 15 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: USSR Ministry of Railways Novo-Basmanaya 2, Moscow B-174, USSR

### 23 142607 PROBLEMS IN THE DEVELOPMENT OF THE RAPID MOVEMENT OF TRAINS [Problemy razvitiia skorostnogo dvizheniia poezdov]

This volume includes articles by scientific workers of Ts.N.I.I., M.P.S., L.I.I.Zh.Ta and specialists of the October Railroad, Lengiprotrans and Giprottranssignalsviaz and the Kalinin Car Construction Plant summarizing the joint scientific research work on organization for high-speed train traffic, the introduction of automation procedures and new technology. The experiences of the Public Scientific-Research Institute of the October Railroad are described. The following topics are included: Problems of High-Speed Development and Constructive Cooperation with Railroad Scientists; Moscow/Leningrad Lines--Experimental Base of Scientific Research; Organization of Scientific Research Work in Cooperation with the October Railroad; Assurance of Safety of High-Speed Trains; Preparation/-Training for High-Speed Running of the Moscow/Leningrad Line; Development Plans of Lengiprotrans for Reconstruction of the Moscow/Leningrad Line; Dynamic Characteristics of High-Speed Electric Trains and Cars and Track Requirements; High-Speed Electric Passenger Cars; Development of Parameters of Electric Cars for High Speed; Steps to Increase Technical Level of the Railroad Industry; Technical Planning and Results of Dynamic

Testing of High-Speed Cars; Track for High-Speed Trains; Reconstruction of Stations of the Moscow/Leningrad Line; Determination of the Work and Cost of Rebuilding a Railroad Line for Preliminary Selection of Optimum Operating Speeds; Determination of Basic Work for Current Line Maintenance; Scientific Research of the Railroad Subdivisions of the Railroad Industry; Application ABM for Estimating Switching Reliability of Heavy Locomotives; Automation of High-Speed Train Control; System of Automatic Multi-Digit Locomotive Signaling Aspects for High-Speed Railways; Improvement of Electric Power Supply; Automation and Mechanization of the Switching Processes at the Leningrad-Sortirovoch-Moscow Station; Economic Problems of High-Speed Trains; Experimental Studies of the Public Science Research Institute of the October Railroad. [Russian]

Abstract only is available in English, original untranslated as of November 1976. LENGIPPROTRANS: Leningrad Transport Construction Designing. GIPROTRANSIGNALSVIAZ: Transportation, Signalization, Communications Designing.

USSR Ministry of Railways 1974, 268 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Leningrad, USSR

### 23 142924 THE BART EXPERIENCE--WHAT HAVE WE LEARNED?

This monograph spells out misjudgements of designers of the Bay Area Rapid Transit System which the author defines as a lack of appreciation of the San Francisco region's highway accessibility, the significance of supplemental accessibility afforded by BART and the traveler's appreciation of time spent getting to moving vehicles as compared to time spent inside them. BART's suburban riders have switched from lower cost buses, have adopted travel patterns which do not relieve highway congestion and BART has not altered automobile use significantly. High capital and operating costs are being compounded by low patronage. It is concluded that high-speed, high-comfort travel on exclusive rights-of-way, features that require mainline rail technology, has insured high costs while a more automobile-like technology would have attracted more riders.

Webber, MM  
California University, Berkeley Monograph No. 26, Oct. 1976, 40 pp

ORDER FROM: Institute of Transportation Research 416 McLoughlin Hall, University of California, Berkeley, California, 94720

### 23 142925 AN ASSESSMENT OF COMMUNITY PLANNING FOR MASS TRANSIT

Contents: v.1. Summary.--v.2. Atlanta case study.--v.3. Boston case study.--v.4. Chicago case study.--v.5. Denver case study.--v.6. Los Angeles case study.--v.7. Minneapolis-St. Paul case study.--v.8. San Francisco case study.--v.9. Seattle case study.--v.10. Washington, D.C. case study.

12 volumes prepared for the Senate Committee on Appropriations Transportation Subcommittee. Volume 11, Technical Report (OTA-26), and Volume 12, Bibliography (OTA-T-27), are available from NTIS.

Skidmore, Owings and Merrill, System Design Concepts, Incorporated  
OTA-T-16--T-25, 1976, Figs., Photos., Refs.

Contract

ACKNOWLEDGMENT: Office of Technology Assessment, U.S. Congress  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402 NTIS

GPO Item 1070

### 23 142927 PUBLIC ACCEPTANCE OF NEW MASS TRANSIT SYSTEM

This paper presents attitudes of townspeople in the Morgantown, W.Va. area toward the Personal Rapid Transit (PRT) System just prior to its opening. The attitudes are derived from home interviews of a representative sample of 305 nonstudent household heads. Two aspects of community acceptance are identified and examined: (1) Whether the respondents think that the PRT will be an efficient means of transportation; and (2) whether the respondents believe that the PRT is an asset to the community. The data indicate that persons who perceive the new system as contributing to a progressive image for the community were generally favorable toward the

PRT. In addition, respondents who now use buses or who anticipate using the PRT are especially favorable toward the system as an asset to the community's image.

Trent, RB Redwine, CN *ASCE Journal of the Urban Plan and Develop Div* Proceeding Vol. 102 No. UP1, Paper 12361, Aug. 1976, pp 225-234

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

**23 142929**  
**URBAN TRAVEL DEMAND MODELS WITH COMPETITIVE MODES**

The principle of microeconomics and consumer demand theory are utilized to form the mathematical structure of urban travel demand models. Competition between the automobile and four different public transportation mode options is considered. The automobile, which competes with one of the public transport options in a transit corridor, is assumed to make up a competitive mode model system. A stepwise linear regression procedure has been used to calibrate and test statistical significance of each competitive mode model system. A sensitivity analysis has been performed to evaluate the effect of multicollinearity upon model parameter estimates. A calibration procedure that insures the model estimates are statistically valid and consistent is presented. An investigation of the Boston metropolitan area is used in a case study.

Ossenbrugger, PJ Li, A *ASCE Journal of Transportation Engineering* Proceeding Vol. 102 No. TE3, Paper 12314, Aug. 1976, pp 585-598

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

**23 142938**  
**A TIME-SERIES ANALYSIS OF THE IMPACT OF MASS COMPETITION ON COMMUTER RAIL RIDERSHIP**

Extension of the Chicago Transit Authority Kennedy rapid transit line into the close-in suburban territory served by the Chicago and North Western's Northwest commuter line has been studied. There was an assessment of effects on ridership, an evaluation of the effect of rail fare increases in the presence of a competing mass transit mode, a study of the time interval of the impact and its geographic range, and an assessment of the impact of the energy crisis on commuter rail usage. This paper gives the background, the methods of study and analysis, and the results with their policy and planning significance.

Seventeenth Annual Meeting of the Transportation Research Forum, Beyond the Bicentennial: The Transportation Challenge, held in Boston, Massachusetts, October 28-30, 1976.

Johnson, C Burrows, B Heramb, C Kunze, RC (Illinois University, Chicago); Sen, AK  
Cross (Richard B) Company Proceeding 1976, pp 211-20, Figs.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

**23 142939**  
**THE BURDENS AND BENEFITS OF BART. A PRELIMINARY CASE STUDY OF RAPID TRANSIT IMPACTS**

The burdens and benefits of the Bay Area Rapid Transit system are detailed. This is a preliminary report of findings from the BART Impact Program because BART services are not yet at "design" levels and because they are based on early surveys. The BART system and the Impact Program are described. BART costs and how their financing is accomplished are explained. The benefits and who receives these benefits, the third section, are followed by conclusions on the burden and benefit and the attitude of Bay Area citizens toward the perceived balances.

Seventeenth Annual Meeting of the Transportation Research Forum, Beyond the Bicentennial: The Transportation Challenge, held in Boston, Massachusetts, October 28-30, 1976.

Shunk, GA English, W (Metropolitan Transportation Commission)  
Cross (Richard B) Company Proceeding 1976, pp 281-89, 2 Tab.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

**23 142954**  
**INTER-CITY 125 INTO SERVICE**

This series of eight short articles marks the introduction of Britain's High Speed Train (HST) into revenue service on the London/Bristol-South Wales route. The articles are as follows: Preparing the way; Track maintenance for high speed; Safety on the permanent way; Timetabling for high speed; Signalling for high speed; Taking HST to the people; Catering catches up; Maintenance on the Western Region.

Kichenside, GM Ford, R *Modern Railways* Vol. 33 No. 337, Oct. 1976, pp 383-401, Photos.

ORDER FROM: University Microfilms International 300 North Zeeb Road, Ann Arbor, Michigan, 48106

DOTL JC

**23 143017**  
**FINANCIAL ANALYSIS OF THE NORTHEAST CORRIDOR DEVELOPMENT PROJECT. VOLUME I: MAIN TEXT AND APPENDIXES A THROUGH D**

A high speed passenger rail service between Washington, D.C., and Boston was called for in the Regional Rail Reorganization Act of 1973. Planning for the service has been conducted by the Office of Northeast Corridor Development in the Federal Railroad Administration. Engineering studies were undertaken to develop detailed plans and costs for the required facilities improvements. The report described the development of financial projections for the service. Operating unit costs were estimated. The operating cost estimates were combined with capital costs based on the engineering studies, and with proposed organizational and funding arrangements to develop financial projections. A computer model was developed to produce pro forma cash flow statements, income statements, and balance sheets for future years. Several organization and funding arrangements were tested. The results were measured in net present value and return on investment. Sensitivity analysis was performed.

Prepared in cooperation with Federal Railroad Administration, Washington, D.C. Office of Northeast Corridor Development.

Baker, HS Laughlin, MO  
Peat, Marwick, Mitchell and Company, Federal Railroad Administration  
Final Rpt. DOT-TSC-FRA-NCD-763I, June 1976, 168 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255616/5ST, DOTL NTIS

**23 143045**  
**TEXAS TRANSIT DEVELOPMENT PLAN 1975-1990**

Contents: History of urban transportation development; Urban transportation development in Texas; The role of transit in Texas; Policy, goals, and objectives for transit in Texas; Future transit travel in Texas; Transit cost-revenue projections for 1980 and 1990; Financing Texas transit programs; Intercity passenger transportation.

Prepared in cooperation with Texas Transportation Inst., College Station, and Smith (Wilbur) and Associates, Washington, D.C.

Texas Mass Transportation Commission, Texas Transportation Institute, Smith (Wilbur) and Associates, Urban Mass Transportation Administration, (UMTA-TX-09-8001) UMTA-TX-09-8001-74-1, Dec. 1974, 205 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-256116/5ST, DOTL NTIS

**23 143047**  
**MACROANALYSIS OF THE IMPLICATIONS OF MAJOR MODAL SHIFTS IN INTEGRATED REGIONAL TRANSPORTATION NETWORKS. PHASE I**

The report describes a macroanalytic approach to the problem of analyzing changing travel patterns in an integrated regionwide transportation network. Separate models of residential areas, transportation corridors, and central business districts are combined in a modular representation of urban structure suitable for use in policy analysis and transportation planning. This analytic approach treats demand parametrically, has minimal data

requirements, and provides rapid insights into the impacts of alternative patterns of transit and automobile usage. Such impacts as travel time, user costs, congestion, and energy consumption are examined explicitly. Application examples discuss the potential economies of scale available from major shifts in current transit usage patterns, tradeoffs between flexible-route and fixed-route systems, and the potential benefits available from policies to reduce the effects of demand peaking.

See also PB-254923 and PB-256137.

Billheimer, JW Bullemer, R Holoszyk, M  
Systan, Incorporated, Department of Transportation Final Rpt. Sys-  
tan-D147, DOT/TST-76-65, Apr. 1976, 225 pp

Contract DOT-OS-50265

ACKNOWLEDGMENT: NTIS  
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PB-256136/3ST, DOTL NTIS

### 23 143048

#### MACROANALYSIS OF THE IMPLICATIONS OF MAJOR MODAL SHIFTS IN INTEGRATED REGIONAL TRANSPORTATION NETWORKS. PHASE I: APPENDICES

Contents: Cost factors (Physical characteristics, capital costs, private auto operating and maintenance costs, private auto parking costs, public transit operating and maintenance costs, allocation of total daily transit system costs between peak and off-peak); Performance factors (Fuel consumption factors, air pollution factors).

See also PB-256136.

Billheimer, JW Bullemer, R Holoszyk, M  
Systan, Incorporated, Department of Transportation Final Rpt. Sys-  
tan-D147-App, DOT/TST-76-66, Apr. 1976, 115 pp

Contract DOT-OS-50265

ACKNOWLEDGMENT: NTIS  
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PB-256137/1ST, DOTL NTIS

### 23 143189

#### DEMAND PROJECTIONS FOR THE NORTHEAST CORRIDOR-FINANCIAL ANALYSIS

The report describes the development and results of intercity travel demand projections by city-pair prepared for the Northeast Corridor financial analysis. In addition associated analyses of projected passenger volumes by station and of selected alternative station sites are included. The report first presents the methodology used both to develop projections of total travel by all modes for each city-pair and to assess the rail share of the total. Next, the development of the travel and socioeconomic data base is discussed. The assumptions and sources used for calibration and projection data sets are given, including travel patterns, travel impedances, and population and income information for each city-pair. Two basic rail alternatives were analyzed: rail service would remain unchanged for 1974 service levels; and the Northeast Corridor Development Program would be implemented by 1982. Finally, the potential benefits of additional service to new or additional suburban station sites north of Philadelphia and New York City are examined.

Prokopy, JC Ruina, DE  
Peat, Marwick, Mitchell and Company, Transportation Systems Center,  
Office of High Speed Ground Transportation Final Rpt. DOT-  
TSC-FRA-NCD-76-4, June 1976, 82 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255851/8ST, DOTL NTIS

### 23 143208

#### BART (BAY AREA RAPID TRANSIT) MULTI-MODAL TERMINAL PLAN, CITY OF WALNUT CREEK, CALIFORNIA

As a basis for evaluating alternative designs to correct the deficiencies of the existing station and to deal with demands from anticipated changes, the following goals were developed: Maximize the value of the public investment in the BART system and encourage use of the system by maintaining and

improving the accessibility of the station to all modes of transportation; conserve fuel and reduce pollution by encouraging use of public feeder transit service to the BART station; improve patron comfort and safety in the station area; encourage development in the station area that will relate to and enhance the value of the BART station as a multi-modal transportation terminal.

Prepared in cooperation with Bay Area Rapid District, Oakland, Calif., and Metropolitan Transportation Commission, Berkeley, Calif.

Duncan and Jones, Sanders Associates, Incorporated, Metropolitan  
Transportation Commission, Urban Mass Transportation  
Administration, D.C., (UMTA-CA-09-0025) UMTA-CA-09-0025-74-2,  
Mar. 1974, 102 pp

ACKNOWLEDGMENT: NTIS  
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PB-256312/OST

### 23 143216

#### URBAN DENSITIES FOR PUBLIC TRANSPORTATION

The report develops relationships to show the suitability of different urban density arrangements to eight modes of public transportation: the taxicab, dial-a-bus, local bus, express bus, light rail, light guideway transit, rapid transit and commuter rail. Differences in transit ridership among urban areas are largely explained by areawide density, downtown size measured in nonresidential floorspace and the existence of rail transit. Operating and capital costs of the eight modes are examined. At any particular residential density, the demand level will vary depending on the area's distance from a non-resident concentration, and on the size and character of that concentration. For a minimum cost per passenger, downtowns of about 10, 15, and 35 million square feet of non-residential floorspace provide minimum, intermediate, and frequent service, respectively. Express buses to which passengers walk must be confined to large cities, and can only operate at very low frequencies. Park-and-ride express bus service can provide low and intermediate service frequencies to downtowns in the 20 to 50 million square foot range or larger. Light rail is promising for downtowns in the 35 to 50 million square foot range. The present generation of automated light guideway transit is limited to special applications, not to line haul use with its high peaks. Rapid transit to a downtown of 50 million square feet of total non-residential floor-space appears to be possible, if favorable construction conditions exist. Residential densities as low as 1 to 2 dwellings per acre can support commuter rail if the route connects to a very large downtown.

Pushkarev, BS Zupan, JM  
Tri-State Regional Planning Commission, Urban Mass Transportation  
Administration, (UMTA-IT-09-0023) Final Rpt. UMTA-IT-09-  
0023-76-1, May 1976, 318 pp

Contract IT-09-0023/31

ACKNOWLEDGMENT: NTIS, UMTA  
ORDER FROM: NTIS

PB-256636/2ST, DOTL NTIS

### 23 143231

#### NORTHEAST CORRIDOR HIGH-SPEED RAIL PASSENGER IMPROVEMENT PROJECT, TASK 14 MODEL INTERMODAL TERMINAL, UNION STATION, PHASE I: TERMINAL REQUIREMENTS REPORT

The study constitutes the first phase of Task 14 of the Northeast Corridor High-Speed Rail Passenger Service Improvement Project and has been prepared for the Northeast Corridor Project Office of the Federal Railroad Administration. The purpose of Task 14 is to investigate the conceptual alternatives for an Intermodal Terminal at Union Station, Washington, D.C., and to prepare a detailed conceptual design for the preferred alternative. The report identifies characteristics and space requirements of an intermodal terminal at Union Station, sets forth parameters for evaluating alternative terminal plans, and reviews selected prior plans for transportation facilities at Union Station.

See also PB-257584.

Skidmore, Owings and Merrill, Office of High Speed Ground Transporta-  
tion Final Rpt. FRA/NEPCO-76-04, June 1976, 306 pp

Contract DOT-FR-66017

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257053/9ST, DOTL NTIS

**23 143233**  
**NORTHEAST CORRIDOR HIGH-SPEED RAIL PASSENGER IMPROVEMENT PROJECT, TASK 14 MODEL INTERMODAL TERMINAL, UNION STATION, PHASE II: ALTERNATIVE CONCEPTS REPORT**

The study constitutes the second phase of Task 14 of the Northeast Corridor High-Speed Rail Passenger Service Improvement Project and has been prepared for the Northeast Corridor Project Office of the Federal Railroad Administration. The purpose of Task 14 is to investigate the conceptual alternatives for an Intermodal Terminal at Union Station, Washington, D.C., and to prepare a detailed conceptual design for the preferred alternative. The report includes plans and sketches, analysis of traffic impact, and preliminary cost estimates for five final alternatives for the Intermodal Terminal at Union Station. The alternatives are evaluated and a preferred concept recommended which involves the shared use of Union Station by the terminal and the National Visitor Center, as proposed by Alternative B-1.

See also PB-257053.

Skidmore, Owings and Merrill, Office of High Speed Ground Transportation Final Rpt. FRA/NEPCO-76-05, June 1976, 167 pp

Contract DOT-FR-66017

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257584/3ST, DOTL NTIS

**23 143962**  
**NORTHEAST CORRIDOR PASSENGER RAIL SYSTEM OPTIONS**

A high speed passenger rail service between Washington, D.C. and Boston was called for in the Regional Rail Reorganization Act of 1973. Planning for the service has been conducted by the Office of Northeast Corridor Development in the Federal Railroad Administration. Engineering studies were undertaken to develop detailed plans and costs for the required facilities improvements. This report identifies rail system options in an unimproved NEC Arena, projects patronage of selected alternatives, studies model transportation in 12 NEC city-pairs as projected to 1982, considers fare and scheduling variations, utilizes newly-developed modal split computer program for selected city-pairs, estimates arena-wide patronage by means of developed expansion factors, and evaluates sensitivity to fare level and schedule patterns.

Aerospace Corporation, Transportation Systems Center, Federal Railroad Administration, Federal Railroad Administration FRA/NEPCO-76/14, Dec. 1975, 40 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257408/5ST, DOTL NTIS

**23 143964**  
**NORTHEAST CORRIDOR HIGH SPEED RAIL SYSTEM PATRONAGE ANALYSIS**

A high speed passenger rail service between Washington, D.C., and Boston was called for in the Regional Rail Reorganization Act of 1973. Planning for the service has been conducted by the Office of Northeast Corridor Development in the Federal Railroad Administration. Engineering studies were undertaken to develop detailed plans and costs for the required facilities improvements. This report provides a program overview, an arena description, a high speed rail system patronage, Northeast Corridor improvement options, high speed rail system improvement options, patronage elasticities, and projections for 1982 and 1990.

Sokolsky, S  
Aerospace Corporation, Transportation Systems Center, Federal Railroad Administration Final Rpt. FRA/NEPCO-76/16, Apr. 1975, 70 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257410/1ST, DOTL NTIS

**23 143965**  
**MARKET RESEARCH AND THE NORTHEAST CORRIDOR PROGRAM**

The report presents a review of selected sources of market research data on intercity passenger transportation in the Northeast Corridor. Available data are reviewed in terms of their usefulness in forecasting patronage of improved rail passenger services, and understanding rail ridership and the process of change in rail ridership. Recommendations are made with respect to use, further analysis, and presentation of existing data, as well as the need for additional, new market research.

O'Donahoe, G Kemp, BL  
Harbridge House, Incorporated, Transportation Systems Center, Federal Railroad Administration, Federal Railroad Administration FRA/NEPCO-76/17, Mar. 1975, 69 pp

Contract DOT-TSC-937

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257411/9ST, DOTL NTIS

**23 143966**  
**THE NORTHEAST CORRIDOR HIGH SPEED RAIL SYSTEM: SELECTED IMPACTS ON ALTERNATIVE MODES**

This report assesses several impacts of improved High-Speed Rail Service in the Northeast Corridor on alternative intercity passenger transportation modes. The impacts are the loss of taxes and toll revenues, loss of passenger revenues to the common carriers, reduction in operating costs and capital needs, and changes in air and highway levels of congestion. The report suggests that the impacts, both favorable and unfavorable, of HSRS on the alternative modes will be limited.

Hayman, D Mulvey, F O'Donahoe, G  
Harbridge House, Incorporated, Transportation Systems Center, Federal Railroad Administration, Federal Railroad Administration Final Rpt. FRA/NEPCO-76-18, Sept. 1975, 75 pp

Contract DOT-TSC-936

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-25712/7ST, DOTL NTIS

**23 143982**  
**DEPLOYMENT SCENARIOS FOR INTEGRATED REGIONAL TRANSPORTATION NETWORKS**

The report describes the cost and service implications of alternative scenarios for the deployment of an integrated regional transportation system in a hypothetical city. The impacts of various levels of user acceptance are investigated. For the selected study area, a limited expansion of integrated transit service to suburbs, and the improvement of off-peak suburban service through the use of flexible-route systems appears desirable. In view of the large areas and low suburban population densities characterizing the study region, full coverage of the entire suburbs appears to be economically feasible only at reduced service frequencies.

Billheimer, JW Bullemer, R Holozyc, M  
Systan, Incorporated, Department of Transportation Final Rpt. Systan-D147-1, DOT-TST-76T-7, Aug. 1976, 145 pp

Contract DOT-OS-50265

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257742/7ST, DOTL NTIS

**23 143984**  
**NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROGRAM. TASK 12.2. CORRIDOR STATIONS PERFORMANCE STANDARDS**

The Railroad Revitalization and Regulatory Reform Act of 1976 authorizes the Secretary of Transportation to implement the Northeast Corridor

Improvement Program to achieve, within 5 years after date of enactment of the Act, establishment of regularly scheduled and dependable intercity rail passenger service between Boston, Mass. and Washington, DC, including appropriate intermediate stops. The Federal Railroad Administration has authorized a number of preliminary programming, planning and engineering tasks to provide the basis for development of final plans for the design and construction work. Performance Standards were developed to serve as the primary source of requirements to be satisfied in the design of the individual stations. The Performance Standards represent a set of generalized planning and design criteria for major functional and operational components of stations and sites documented in terms of quantities, sizes, levels of service and performance characteristics related to 1990 patronage projections. These Performance Standards are to become part of a Work Package for each station that will also include a Station Program, Schematic Design Drawings, Outline Specifications, a Cost Estimate, and an Implementation Schedule.

See also PB-244 873.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.2, May 1976, 406 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS

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PB-257750/OST

### 23 143999

#### NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROGRAM. TASK 12.1. CORRIDOR STATIONS REQUIREMENTS

The Railroad Revitalization and Regulatory Reform Act of 1976 authorizes the establishment of regularly scheduled and dependable intercity rail passenger service between Boston, Mass. and Washington, DC, including appropriate intermediate stops. As a basis for the development of the Federal Railroad Administration design and construction program to significantly improve intercity rail passenger service facilities at selected stations along the Northeast Corridor, this report provides the background material and methodology used in the development of the requirements for the design of the Stations. It documents the review of earlier work, the development of performance standards, the evaluation of existing conditions, the development of concept plans, and the evaluation process for selection of recommended plans. Finally it outlines the format for subsequent development of schematic plans and breakdown of work units into work elements.

See also PB-244 873.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.1, July 1976, 470 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS

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PB-258176/7ST, DOTL NTIS

### 23 144032

#### LIGHT RAIL TRANSIT: ITS NATURE AND ROLE

The U.S. Department of Transportation's policy to support efforts to develop a type of rail system which is less costly to build, operate and maintain than conventional rail transit (CRT) systems is noted, the rather arbitrary distinctions between the latter and light rail transit (LRT) systems are discussed, the principal characteristics of selected LRT systems are tabulated, and the key features common to all such systems are listed. The LRT systems may range from the simple streetcar line to the high capacity CRT and the heavy main-line commuter rail service. LRT's flexibility permits its operation anywhere that tracks and overhead wire can be constructed. This flexibility is derived from the overhead power collection and the ability to handle passengers at either high or low platforms. Significant cost savings and operating flexibility result from LRT's ability to run on "open" surface lines as well as in subways. Attention is focussed on certain noteworthy features of the Cleveland Shaker Heights LRT system, the MBTA Blue Line CRT system, and the San Francisco Muni Metro now under construction. It is suggested that any metropolitan area planning a new transit system or an unconstrained addition to an old system should consider LRT as an alternative.

Seamon, JH *Transportation Research Circular* No. 66, Sept. 1976, pp 7-9, 1 Fig., 1 Tab.

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### 23 144077

#### TALK IS CHEAPER

Telecommuting, moving the work to the worker, may have considerable impact on the planning of the cities of the future. It is particularly suited to industries primarily engaged in the collection, storage and manipulation of information. The decentralization decision of a major insurance company in Los Angeles provided a practical illustration of the concept. Productivity increased at satellite offices. The effect this could have on mass transportation systems is discussed.

Nilles, JM (University of Southern California) *IEEE Spectrum* Vol. 13 No. 7, July 1976, pp 91-93

ORDER FROM: ESL

DOTL JC

### 23 144103

#### THE SELLING OF RAIL RAPID TRANSIT

This book is basically a critical review of rail rapid transit in the USA, and contains nine chapters as follows: (1) Transportation and urban location behavior in perspective; (2) Defining the problem: public transport criteria and rail rapid transit mythology; (3) Rail versus bus: the art of evaluating alternate modes; (4) Failure of a mission; (5) Metro: another monument for the nation's for capital; (6) MARTA: planning massive accessibility for central Atlanta; (7) Rail advocacy in autopia: the Los Angeles country case; (8) Rail rapid transit blues for St. Louis: the collapse of an illusion; (9) Concluding observations.

Hamer, AM

Teakfield Limited Book 1976, 353 pp, Figs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 221667)

ORDER FROM: Teakfield Limited 1 Westmead, Farnborough, Hampshire GU 14, England

### 23 145179

#### ROUTE SELECTION IS CRITICAL FACTOR IN DESIGN OF RAPID TRANSIT SYSTEMS

This paper examines and compares the Washington METRO System and the BART System with respect to route selection, station location, and service to the metropolitan area. The Washington METRO, less restricted by geographical and political constraints, is a more flexible system and offers a more flexible service. BART is a commuter rail system that complements the local transit systems, while METRO will become the backbone of an integrated regional transit system.

Seamon, JH *Transportation Research News* No. 65, July 1976, pp 15-17

ORDER FROM: TRB Publications Off

DOTL JC

### 23 145323

#### GENERALIZED ATTRIBUTE VARIABLE FOR MODELS OF MODE CHOICE BEHAVIOR

This paper discusses how abstract transportation system characteristics like convenience can be quantified by using psychometric scaling techniques and can be included as explanatory variables in models of travel demand behavior. A survey was conducted to collect time and cost information on alternative modes of transportation for the journey to work and attitude data on 14 attributes representing convenience. Importance scores were derived for the attributes by using the Thurstone scaling technique. A generalized convenience variable was constructed based on a linear combination of individual satisfaction ratings of the convenience attributes weighted by their derived importance scores. Models of mode choice behavior was calibrated by using a logit function that was estimated by a maximum likelihood procedure. Comparisons were made between models that used only time and cost variables and those that included the generalized convenience variable. The goodness of fit was significantly better with models that included the convenience variable than with models that were based strictly on time and cost variables. It was concluded that the



generalized attribute approach is a feasible concept that can significantly improve the explanatory power of conventional models of travel behavior. /Author/

Spear, BD (Federal Highway Administration) *Transportation Research Record* No. 592, 1976, pp 6-11, 3 Tab., 14 Ref.

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**23 145324**

**PERCEPTION OF THE AVAILABILITY OF TRANSPORTATION ALTERNATIVES FOR VARIOUS TRIP PURPOSES**

Mode choice models require five decisions concerning model structure. These are the selection of (a) a statistical technique, (b) the method of comparing the characteristics of competing modes, (c) the method of representing socioeconomic variables, (d) objective or subjective measures of times and costs, and (e) objective or subjective criteria for separating those who choose among modes from those who are captive to a mode. The purpose of this paper is to examine the implications of the subjective approach to separating choosers from captives. To do this, various models that distinguish choosers from captives are developed. The data were obtained from a stratified probability sample of 223 households from the Santa Monica-west Los Angeles, California, area. Variables distinguishing choosers from captives for the work trip and the most frequent nonwork trip as well as personal and locational descriptors of the individual and information on the characteristics of the competing modes were available. Logit analysis was used to test the alternative models, and the conclusion reached was that models containing specific information about the characteristics of the competing modes were superior to models containing only locational and personal information on individuals. The implications of this finding in terms of predicting modal split, understanding transportation behavior, and transportation policy are noted. /Author/

Tardiff, TJ (California University, Davis) *Transportation Research Record* No 592, 1976, pp 12-16, 2 Tab., 18 Ref.

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**23 145325**

**METHODOLOGY FOR ANALYZING ERRORS IN PREDICTION WITH DISAGGREGATE CHOICE MODELS**

Predictions of future travel behavior and of the performance of alternative transportation systems are needed by transportation planners and decision makers to determine the desirability of alternative transportation plans. The usefulness of predictions, and consequently of prediction methods, depends on their accuracy. This paper presents a methodology for analyzing errors in prediction with disaggregate choice models. The paper describes the process by which disaggregate choice models are formulated and used for prediction. The sources of error in the model formulation and prediction process are identified. The interaction and propagation of these errors to the final prediction are analyzed. A set of error measures is proposed for evaluating the performance of alternative prediction models. A strategy is developed for analyzing the source of different components of the total error. An empirical analysis of errors in the prediction of mode choice to work illustrates the use of this approach for evaluation the accuracy of a set of prediction models, identifying major sources of error in prediction, and suggesting steps that can be taken to improve these prediction models. /Author/

Koppelman, FS (Northwestern University, Evanston) *Transportation Research Record* No. 592, 1976, pp 17-23, 2 Fig., 3 Tab., 12 Ref.

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**23 145326**

**ALTERNATIVE SAMPLING PROCEDURES FOR CALIBRATING DISAGGREGATE CHOICE MODELS**

In this paper, three sampling techniques for calibrating disaggregate travel demand models are considered: random, stratified, and choice-based sampling. In a random sample, the probability of all members of the population being in the sample is equal; in a stratified sample, the population is divided into groups based on one or more characteristics and each group is sampled randomly but at different rates; and in a choice-based sample, the number in the sample selecting each alternative is predetermined, i.e., the sample is based on the outcome of a behavioral choice process. Existing disaggregate choice calibration methods yield consistent parameter esti-

mates for random and stratified sampling techniques. Although maximum likelihood estimation for the third technique is extremely complex, an alternative, tractable estimator whose estimates are both consistent and asymptotically normal exists. This new estimation technique can be applied by using existing capabilities in ULOGIT or other multinomial logit estimation programs with only minor revisions. This implies that choice-based samples such as on-board surveys and roadside interviews can now be used for disaggregate model calibration. This should substantially reduce the cost of data collection in disaggregate model development. In addition, it opens an entire range of questions regarding the most appropriate sample design for future data collection efforts oriented toward the development of disaggregate choice models for urban travel demand forecasting. /Author/

Lerman, SR (Massachusetts Institute of Technology); Manski, CF (Carnegie-Mellon University) *Transportation Research Record* No. 592, 1976, pp 24-28, 7 Ref.

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**23 145331**

**PARAMETRIC ACCESS NETWORK MODEL**

Parametric models are calibrated for the access portions of rail and bus trips. The models are designed to predict average zonal travel times as a function of the transportation system, zone size, and volume-related characteristics of a zone. The calibrated models are access walking, driving, and bus-riding time for rail trips and walking time to a stop for bus trips. Corresponding models are developed for the within-zone variance of the access time. These models provide input to the existing travel demand forecasting process by systematizing the way in which the access times are currently obtained for network coding. The importance of these values for travel forecasting has been repeatedly demonstrated in the past. These models also enable the use of large zones to help simplifying and speed up the transportation plan analysis and evaluation process. The predictive accuracy of the final models is evaluated in terms of standard indexes of forecasting accuracy. The results show that the coefficients of determination are high and that the coefficients of variation are low for all the models. Thus, the models should find an immediate use in transportation planning. /Author/

Talvitie, A (California University, Los Angeles); Leung, T (Oklahoma University) *Transportation Research Record* No. 592, 1976, pp 45-49, 9 Ref.

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**23 145554**

**NORTHEAST CORRIDOR PASSENGER TRANSPORTATION DATA STUDY**

Fourteen measures of performance are recommended for use in Northeast Corridor rail system evaluation and multimodal comparisons. These include performance measures in the categories of system configuration (e.g., daily available-seat miles by vehicle and segment), system performance (e.g., load factor by vehicle and segment) and system economics (e.g., cost per revenue-passenger mile by vehicle and segment). Although current data reported by certificated air carriers and participating passenger railroads are not entirely consistent, sufficient data exist to permit effective intra- and inter-modal evaluation and comparison. Certain disaggregation or allocation algorithms are recommended in some cases, however, to obtain travel segment data at the suggested aggregation level and frequency. (Portions of this document are not fully legible.)

Prepared by Aerospace Corp., El Segundo, Calif. See also PB-258179. (PC A06/MF A01)

Transportation Systems Center, Aerospace Corporation, Federal Railroad Administration Final Rpt. DOT-TCS-FRA-76-20, FRA/NECPO-76/09, Aug. 1976, 111 pp

Contract DOT/TJC-FRA-76-22

ACKNOWLEDGMENT: NTIS  
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PB-259264/0ST, DOTL NTIS

23 145598

**WEST COAST CORRIDOR STUDY INTERIM REPORT,  
JANUARY 1976. PREPARED IN RESPONSE TO SECTION 13 OF  
THE AMTRAK IMPROVEMENT ACT OF 1974**

The report was prepared in response to the High Speed Ground Transportation Act as amended by Section 13 of the Amtrak Improvement Act of 1974 providing an early and realistic understanding of the magnitude and scope of the intercity transportation needs of the West Coast States. The findings include the following: (1) The problems are primarily state and local in character and are largely confined by differing demographic, geographic and travel characteristics to three distinct segments: the southern one-third of the corridor from Tijuana, Mexico to Sacramento, California, the northern one-third from Eugene, Oregon to Vancouver, Canada, and the middle one-third between Sacramento, California and Eugene, Oregon; (2) state-wide intermodal transportation planning should be encouraged to achieve a balanced transportation system in the area, and conserve energy resources; (3) the tentative economic social and environmental costs of advanced technology rail passenger systems outweigh the benefits to be achieved based upon population growth rates and the location of that growth.

Thomas, GR Winestone, RL

Federal Railroad Administration Intrm Rpt. FRA/RFA-1-76-02, Mar. 1976, 45 pp

ACKNOWLEDGMENT: NTIS

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PB-258440/7ST, DOTL NTIS

23 145884

**TRAFFIC, REVENUE AND OPERATING COSTS-AUTHORIZED  
REGIONAL SYSTEM. (REVISED FEBRUARY 1971)**

The report describes the projected rail, bus and highway systems for 1990, projected fare system, forecasted 1990 patronage, revenue estimates and operating costs of the transit system.

Prepared in cooperation with Voorhees (Alan M.) and Associates, Inc., McLean, Va. Prepared for the Washington Metropolitan Area Transit Authority, D.C. Supersedes PB-257 701.

Gilman (WC) and Company Incorporated, Voorhees (Alan M) and Associates, Incorporated, Washington Metropolitan Area Transit Authority Feb. 1971, 141 pp

ACKNOWLEDGMENT: NTIS

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PB-257701/3ST, DOTL NTIS

23 147581

**MODELS OF RAILROAD PASSENGER-CAR REQUIREMENTS  
IN THE NORTHEAST CORRIDOR. VOLUME I: FORMULATION  
AND RESULTS. VOLUME 2: USER'S GUIDE**

Models and techniques for determining passenger-car requirements in railroad service were developed and applied by a research project of which this is the final report. The report is published in two volumes, as follows: Volume I: Formulation and Results. The first part of this volume considers a general problem of determining optimal passenger-car allocations given a fixed schedule and predetermined demands. Requirements for car movements are modeled as a set of linear constraints having a transshipment structure, and alternative linear objectives are formulated. Various optimization techniques are developed for one or more objectives, and properties of the sets of optimal solutions are demonstrated. The remainder of Volume I shows how the linear model and optimization techniques may be applied to the Northeast Corridor. Derivations of a schedule and demands are explained, and results of a number of optimizations and analyses are displayed. Volume II: User's Guide. The solution and analysis of the Northeast Corridor models required the creation of a number of computer programs of several kinds. These programs are available for the use of others and are described in Volume II of this report.

Research was sponsored by the FRA's Northeast Corridor Project Office under contract to the Transportation Systems Center, DOT, Cambridge, Massachusetts.

Fourer, R

National Bureau of Economic Research, (DOT-TSC-FRA-7626-1&2) Final Rpt. FRA/NECPO-76/21&22, Sept. 1976, 138 pp, Figs., 7 Ref., Apps.

Contract DOT-TSC-1179-1&amp;2

ACKNOWLEDGMENT: FRA

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23 147677

**NEW LIFE FOR GLASGOW TRAVEL TUNNELS**

The author reviews the state of passenger transport in Glasgow and describes improvements being made to bus, underground and rail services. The underground system is to be completely rebuilt and new 2 or 3 car trains at a 2 minute frequency brought into service. British Rail's central low level line which passes beneath the city is to be reopened and will link the north and south electric systems. Other alterations described include the elimination of through traffic from part of the city centre and a city centre circular bus service to link Glasgow's inter-city stations. Brief details are given of the work involved and the problems that have been encountered. /TRRL/

Merchant, M *Surveyor - Public Authority Technology* Vol. 147 No. 4385, pp 9-11, 3 Fig., 5 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 221487)

ORDER FROM: IPC Building and Contract Journals, Limited 32 Southwark Bridge, London SE1, England

23 147831

**TRAINS REPLACE TRAMS UNDER BRUSSELS**

After a lengthy build-up time with pre-metro operation, this month sees inauguration of full metro services on the central east-west line of the Brussels rapid transit network from Place St. Catherine to Tomberg and Beaulieu. G. Cudell, Chairman of the Brussels Metro Authority, explains that plans for two eastward extensions of the metro are at an advanced stage, but indicates that further metro construction is unlikely in the foreseeable future.

*Railway Gazette International* Vol. 132 No. 9, Sept. 1976, pp 343-44

ACKNOWLEDGMENT: British Railways

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DOTL JC

23 147858

**ON ESTIMATING EFFECTIVE FREQUENCIES AND AVERAGE  
WAITING TIMES FOR INDIRECT CONNECTIONS**

This paper is concerned with the problem of estimating two important service properties of transportation systems in which a traveler may have to use more than one vehicle to complete his journey, such as in urban public transport or intercity air, bus or rail systems. The service properties are waiting time for connections and effective frequency of service from origin to destination. These two service characteristics are among those five-cost, travel time in the vehicle, waiting, access time, and departure frequency-typically found to be most important in transportation planning models for estimating system usage. Despite their importance, there exist no methods for estimating waiting time and frequency which are compatible with the information available in transportation planning studies. In this paper theoretical models for estimating these are developed and then tested with actual data. They are found to be quite accurate in terms of quality of fit to the empirical data. Their use in urban and intercity transportation planning contexts is described, along with the data required, which consists simply of the number of vehicle trips on each of the links and for each of the time periods of interest. /Author/TRRL/

Sen, AK (Illinois University, Urbana); Morlok, EK (Pennsylvania University, Philadelphia) *Transportation Planning and Technology* Vol. 3 N 1976, pp 175-83, 1 Tab., 9 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-223276)

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23 147866

**WILL RAIL INTERCHANGES LEAD LIVERPOOL CITY CENTRE  
REVIVAL?**

An outline of the new Merseyside Underground railway system due for completion by summer 1977 is given. The idea of the 'loop and link' system is to give people easy access to all parts of Liverpool city centre by getting people to make the change from bus to rail out in the suburbs. At the

moment the number of potential users of the new system is thought not to be very great but the planners hope that the new system itself will help to initiate a revival in the city's economic fortunes and hence lead to a greater demand for public transport. /TRRL/

Merchant, M *Surveyor - Public Authority Technology* Vol. 148 No. 44, Oct. 1976, pp 12-13, 2 Fig., 3 Phot.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-222790)  
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**23 147869**

**AN INTERIM REPORT ON INTER-CITY PASSENGER MOVEMENT IN CANADA**

This report represents a first attempt to develop a comprehensive overview of inter-city passenger transportation in Canada, with the exception of ferry services. It indicates the analytical basis for the government's review of transportation policy, and serves as a basis for public discussion. /TRRL/

Transport Canada June 1975, 150 pp, Figs., Tabs.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada (RTAC02150E), Transport and Road Research Laboratory (IRRD-222698)

ORDER FROM: Transport Canada Tower C, Place de Ville, Ottawa, Ontario K1A 0NS, Canada

**23 147870**

**INTERCITY PASSENGER TRANSPORT IN CANADA**

The Systems Analysis and Research Data Base Branch of the Commission undertook a comprehensive review of certain aspects of intercity passenger transport. This report has been prepared with the purpose of presenting a synthesis of the information and material developed in the review. It is intended to be of help in clarifying some of the current issues, identifying areas requiring further research, and acquainting the interested reader with the nature and extent of intercity passenger transport in Canada. /TRRL/

Platts, J

Canadian Transport Commission No. 252, Dec. 1975, 169 pp, Figs., Tabs.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada (RTAC02144E), Transport and Road Research Laboratory (IRRD-222692)

ORDER FROM: Canadian Transport Commission Congill Building, 275 Slater Street, Ottawa, Ontario K1A 0N9, Canada

**23 148258**

**COMPARISON OF THE CAPITAL COSTS OF BUILDING BART AND FREEWAY AND BUS ALTERNATIVE**

The cost of building the Bay Area Rapid Transit (BART) system is compared to that of a hypothetical feedway and bus alternative. The alternative was developed by drawing from State Highway Department plans for freeways that parallel the BART system within the same approximate corridors. The ability of both systems in Fiscal Year 1978 to move the overall daily use of the freeways is considerably higher than that of BART. When BART reaches its design capacity it will have the ability to move significantly more people during the peak hour than will the highway alternative, but overall it still will not be used as fully as the highway system. The highway alternative, including the cost of cars and buses, costs slightly less than BART in constant 1972 dollars.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

English, W (Metropolitan Transportation Commission, Berkeley)  
American Society of Mechanical Engineers Conf Paper Paper P&P-24, 1976, 5 pp

ACKNOWLEDGMENT: EI  
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**23 148259**

**MEDIUM CAPACITY TRANSIT SYSTEM ALTERNATIVES FOR THE LOS ANGELES REGION**

A study of medium capacity transit system alternatives was carried out for the Southern California Rapid Transit District (SCRDT). The study

provided SCRDT with information needed to complement earlier studies which dealt with conventional rail and bus alternatives. It was concluded that, on balance, a light rail vehicle system constituted a viable option for rapid transit service on some corridors in the Los Angeles metropolitan Area. For a variety of reasons, an automated small vehicle group rapid transit (GRT) system does not appear to be well-suited for immediate adoption.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, 18-23 July 1976. See also RRIS 04 148248.

Kudlick, W (De Leuw, Cather and Company)  
American Society of Mechanical Engineers Conf Paper Paper P&P-29, 1976, 5 pp

ACKNOWLEDGMENT: EI  
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**23 148262**

**TOWARD A METHODOLOGY FOR EVALUATING ALTERNATIVE TRANSIT STATION DESIGNS**

The paper describes a comprehensive approach for transit station design that includes criteria development for system users and operators. The approach involves an iterative process wherein a basic design is created and evaluated relative to established criteria and then incrementally modified until all objectives are satisfied. A comprehensive set of criteria for assessing the performance of alternative transit station design configurations is provided and an interest-impact matrix model is recommended for transit station evaluations. The potential of the evaluation framework is in application to numerous terminal design settings.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Hoel, LA (Virginia University); Demetsky, MJ  
American Society of Mechanical Engineers Conf Paper Paper D&O-26, 1976, 4 pp

ACKNOWLEDGMENT: EI  
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**23 148264**

**OVERVIEW OF EUROPEAN LIGHT RAIL DEVELOPMENT AND ITS SIGNIFICANCE IN NORTH AMERICA**

The paper discusses the development of transit planning concepts in Europe as they relate to light rail systems, and shows how these concepts are intertwined with the parallel development of technology and operating techniques. Of particular interest are those areas in which a consensus appears to have developed, such as in the design of vehicles and the treatment of grade crossings and intersections. In the past few years two forms of light rail are becoming discernable. These are typified by the high performance, high investment systems, and by a recent variation which seeks to achieve comparable performance by a low impact, low investment approach, relying heavily on exclusive transit lanes and signal pre-emption.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976, See also RRIS 04 148248.

Fox, G (De Leuw, Cather and Company)  
American Society of Mechanical Engineers Conf Paper Paper P&P-26, 1976, 8 pp

ACKNOWLEDGMENT: EI  
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**23 148293**

**DEVELOPMENT OF A MODEL FOR ANALYSIS OF THE COST EFFECTIVENESS OF ALTERNATIVE TRANSIT SYSTEMS**

A theory has been developed for preliminary analysis of transit alternatives by which estimations of average performance, power use, and cost effectiveness of all types of transit alternatives (scheduled, demand-responsive, automated, manually driven) may be computed for given and varying population distributions and travel behavior. Computation on a digital computer for a specific set of input parameters is very rapid, therefore extensive parametric analysis of each alternative is possible with respect to variations in over 70 geometric, kinematic, dynamic, service and economic variables. A new method of application of mode-split theory is used, and the computation technique correctly accounts for all modes of access to and egress from transit stations or stops without use of ad hoc assumptions.

This paper was presented at the International Conference on Personal

Rapid Transit held in Denver, Colorado, September 16-19, 1975.  
 Anderson, JE (Minnesota University, Minneapolis)  
 Colorado University, Denver Conf Paper Vol. 1, Paper 9, 1975, 42 pp, 12 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

23 148311

**ROLE OF NEW TECHNOLOGY IN URBAN TRANSPORTATION:  
 AN HISTORICAL PERSPECTIVE**

A framework presenting a broad perspective of technology innovations is developed from a study of past innovations in urban transportation. Observations are forwarded on the characteristic life-cycle of "new" technologies. Key determinants of past successful and unsuccessful innovation efforts are identified and relevant theories examined. The methodology is then used to evaluate the present innovation efforts towards automation of urban transportation, in particular Personal Rapid Transit.

This paper was presented at the International Conference on Personal Rapid Transit held in Denver, Colorado, September 16-19, 1975.

Kornhauser, AL (Princeton University); Wilson, LB  
 Colorado University, Denver Conf Paper Vol. 1, Paper 1, 1975, 39 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Denver Center for Urban Transportation Studies, Denver, Colorado, 80202

23 148717

**PRINCIPLES FOR DEVELOPMENT OF AUTOMATED CONTROL SYSTEMS FOR URBAN TRANSPORTATION AND THE METHODS USED [Printsiy sozdaniia avtomatizirovannykh sistem upravleniia dvizheniem gorodskogo obshestvennogo transporta i kharakteristika ispol'zuemykh tekhnicheskikh sredstv]**

The main goal of controlling urban passenger transportation is satisfying travel needs while utilizing resources with maximum efficiency. Three stages of automated control are evolutionary. Initially dispatcher communications is followed by information display and then the stage which has been achieved: Automated systems of traffic control for individual types of urban transport. The ASSDY-A automated system of control for buses and the ASDY-3 for electrified city transport, streetcars and trolleybuses, can be developed into the ASDY-MT automated system of dispatcher control for routed transport. A separate system for control of taxis also exists. At present the automated system of dispatcher control is being implemented in various USSR cities. [Russian]

Complete translation is available for reference. Contact Technology Planning Office, Office of Research and Development, Federal Railroad Administration, U.S. DOT.

USSR Ministry of Housebuilding & Communal Economy No Date, 21 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: USSR Ministry of Housebuilding & Communal Economy Moscow, USSR

24 094039

**REPORT ON RAIL WAGE AND EMPLOYEE STATISTICS**

The report reviews two principal sources of railroad wage and employee statistics presently available on computer tape. It analyzes each of the records for adequacy and presents recommendations for use of the data. In addition, other sources for wage statistics and related data are discussed. Portions of this document are not fully legible.

Tross, AJ Barringer, SH Whitten, HO  
Whitten (Herbert O) and Associates, Federal Railroad Administration  
DOT-FR-55097, FRA-63504, June 1975, 210 pp

Contract DOT-FR-55097

ACKNOWLEDGMENT: NTIS, FRA  
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PB-248782/5ST, DOTL NTIS

24 130192

**RAILROAD TRANSPORT IN THE USSR AND ABROAD**

[Zheleznodorozhnyi transport v SSSR i za rubezhom]

This publication presents materials and an analysis on a series of problems on the state and development of technical equipment, organization, and technology of transportation processes and the economies of railroads in the U.S.S.R. and abroad. Also examined are the level and change of the fundamental work indices and the technical equipment of USSR railroads in 1974. This issue is prepared according to investigatory work materials completed in USSR Ministry of Railroads, and is recommended for Railroad Ministry workers in the branches and administrations for roads and other subdivisions of railroad transportation, scientific research institutes and planning organizations, the higher educational institutions, and transport subdivisions of institutions and organizations. Included is an analysis of the basic funds and utilization indices for the railroads of both the USA and USSR. The chapters are (1) Fundamental work indices of USSR railroads in 1974; (2) Organization and technology of transport work; (3) Reliability increase in the structures of basic locomotive assemblies; (4) Perfection in organization of maintenance and current repair of freight cars; (5) Track and track management; (6) Automation, remote control, and communication; (7) Freight car movement control; (8) Energy supply systems of electrified railroads; (9) Freight yards for general usage of railroad abroad; (10) Basic funds and their utilization indices on railroads in the USSR and the USA. Also included is a statistical appendix. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

Ts.N.I.T.E.I. Survey Vol. N 1975, 256 pp, 46 Fig., 33 Tab., 158 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: Ts.N.I.T.E.I. Raushskaia Nab 4, Moscow, USSR

24 130232

**SOVIET RAILROAD REGULATIONS [Ustav zheleznykh dorog Soiuza SSR]**

These regulations consist of the following chapters: (1) General principles; (2) Cargo management. Arrangements for servicing passengers; (3) Planning and organization of cargo transportation; (4) Railroad spurtracks; (5) Through train mixed with other forms of transport; (6) Transportation of passengers, baggage, and mail; (7) The responsibility of railroads, cargo dispatchers, cargo receivers, and passengers; actions, claims, and suits. [Russian]

Abstract only is available in English, translation in process as of November 1976. Revised and updated as of January 1, 1974.

Transport Publishing House 1974, 104 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House Basmannyi Tupik, 6a, Moscow B-174, USSR

24 130240

**SOVIET RAILROAD TECHNICAL OPERATION RULES [Pravila tekhnicheskoi ekspluatatsii zheleznykh dorog Soiuza SSR]**

These rules contain the following information: (I) General obligations of railroad transport workers; (II) Constructions, and systems for maintaining them: (1) general principles, dimensions; (2) construction and track administration plan, track profile, subgrade, upper track structure, artificial

constructions, switching crossings, intersections, track and signaling signs; (3) water supply and regenerating means, signaling and communication, signals, automatic and semiautomatic blocking, centralization of switches and signals, dispatcher centralization, automatic locomotive signaling and automatic stops, switch dependency, station blocking, track obstructions, low voltage lines and communications; (6) electrical supply of electrified railroads and energy management; (7) inspection of constructions and their repair; (III) Rolling Stock and its Maintenance: (1) general requirements; (2) wheelsets; (3) braking and cushioning arrangements; (4) maintenance, upkeep, and repair of rolling stock; maintenance of rail cars: (IV) Organization of Train Traffic; (1) timetable; (2) distribution points, organization of technical operation of the stations, general requirements operation of switching crossings, execution of switching, formation of railcars in cargo trains, sequency of switching brakes in the trains: (V) Train traffic: reception and departure of trains, means of signalling and communication during train traffic, sequence of action during obligatory stop of train. Finally, the handbook concludes with a list of terms employed in the rules of technical operations of USSR railroads. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1970, 159 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

24 137037

**SHORT LINE RAILROAD OPERATIONS AS AN ALTERNATIVE TO LOSS OF RAIL SERVICE: PROS AND CONS**

The report asserts the probability of future widespread abandonments of branchline rail freight service. It stipulates the circumstances in which abandonments are most likely to occur, and assesses the negative impacts that may result. It is suggested that short line railroad operations may be an alternative to the complete loss of rail service. The report describes the savings that may accrue through a changeover from major railroad ownership to short line operation. Alternative institutional and financial mechanisms for establishing and operating short line roads are discussed. A broad description of capital and operating costs is given. Finally, several examples are provided of successful short line operations in the United States.

Prepared in cooperation with Council of State Governments, Lexington, Ky.

Due, JF  
Wisconsin Department of Transportation, Federal Railroad Administration, Council of State Governments Apr. 1976, 44 pp

Contract DOT-FR-40025

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-253673/8ST, DOTL NTIS

24 137410

**NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER IMPROVEMENT PROGRAM. MATERIALS AND EQUIPMENT DEMAND/SUPPLY STUDY**

The report presents the results of a demand/supply analysis of the major materials and equipment required by the Northeast Corridor rail passenger service improvement program. The purpose of the study is to identify those items (1) where design and specifications, and production lead-times may have a major impact on delivery and price, and (2) where development of long-term procurement arrangements with suppliers is essential to assure continuity of supplies during the 1976-82 time period because of the possible emergence of capacity bottlenecks. This study is also intended to assist in the development of alternatives to de facto cost plus pricing proposals by suppliers of materials and equipment, especially those involving long lead-times.

Richardson Associates, Federal Railroad Administration Final Rpt. FRA/NECPO-76/06, June 1976, 70 pp

Contract DOT-FR-56010

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-254881/6ST, DOTL NTIS

24 138068

**INFORMATION AVAILABLE ON ESTIMATED COSTS TO REHABILITATE THE NATION'S RAILROAD TRACK AND A SUMMARY OF FEDERAL ASSISTANCE TO THE INDUSTRY: REPORT TO THE SUBCOMMITTEE ON FEDERAL SPENDING PRACTICES, EFFICIENCY, AND OPEN GOVERNMENT, SENATE COMMITTEE ON GOVERNMENT OPERATIONS, BY THE COMPTROLLER GENERAL OF THE UNITED STATES**  
No Abstract.

General Accounting Office RED-76-44, Nov. 1975, 53 pp, Tabs.

ACKNOWLEDGMENT: Northwestern University, Evanston  
ORDER FROM: General Accounting Office 441 G Street, NW, Washington, D.C., 20548

24 139308

**NEW LOOK AT POSSIBILITY OF GOVERNMENT OWNERSHIP OF RAILROAD RIGHTS-OF-WAY**

This two-part report of a speech, "Problems of the Capital Crunch: Public vs. Private Capital," discusses the implications of the Railroad Revitalization and Regulatory Reform Act of 1976, tracing the role of public and private capital in railroads through their history. While it would represent a departure from American private-enterprise tradition and mythology, the author advocates serious consideration for the alternatives of nationalizing all or some of the railroads, or of public ownership of some or all of the rights-of-way, leaving the actual operations over these facilities to private corporations which would pay user charges. The 4R Act requires the Secretary of Transportation to evaluate benefits and costs of public ownership of railroad fixed plant and one means of achieving such ownership is suggested.

Weller, J *Traffic World* Vol. 167 No. 2, Dec. 1976, 7 pp

ORDER FROM: Traffic Service Corporation 815 Washington Building, Washington, D.C., 20005

DOTL JC

24 139383

**ST LOUIS HELICOPTER PROJECT-A COOPERATIVE EFFORT AMONG FOURTEEN RAILROAD DEPARTMENTS**

The specific objective of the project, undertaken and funded by the Department of Transportation, was to test and demonstrate the effectiveness of a collective approach to railroad security by coordinating the efforts of all security resources within the railyards at St. Louis-East St. Louis. These resources included a helicopter and special communications equipment for common use among several railroad companies. The report describes the Railroad Police System in Greater Metropolitan St. Louis and then deals with the implementation of the project including securing equipment, insurance, and training. The operation of the system is documented including the determination of flight schedules, radio procedures, surveillance, and apprehension procedures used by the helicopter. The impact of the project is evaluated and nineteen recommendations on how a permanent airborne surveillance program should be organized and operated are set forth. The findings support the conclusion that helicopters can be an effective component of a railroad security system. The project also demonstrated the effectiveness of coordinating and pooling all available law enforcement resources in reducing vandalism, trespassing, and cargo theft. There was a marked increase in joint police ventures and the concept of a common radio frequency was almost universally endorsed by the participating railroad police. Appended to the report are a copy of the helicopter services contract, a personal injury liability agreement, and the project evaluation forms used by the participants.

Sponsored by UMTA.

Patterson, TV Sanders, MS  
Naval Ammunition Depot DOT-P-5200.9, 1973, 111 pp

ACKNOWLEDGMENT: Department of Justice  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

24 139384

**AIRBORNE ASSISTANCE FOR RAILROAD CRIME**

The main object of the patrol was to eliminate as many trespassers as possible, thereby decreasing the number of potential vandals and thieves. The Railroad Police Departments programmed priority patrol efforts during peak vandalism periods. Special equipment for patrol helicopters consisted of an electronic siren, a three million candlepower spotlight, and radio channels for the railroads. Three methods were devised to protect a train through a trouble area. A prior overflight was meant to startle potential vandals and make them aware that their activities were being watched. Trailing the train at a discreet distance was a technique used when apprehension of those attacking a movement was intended. Circling a train was used to prevent attack. This program proved so successful that it was established as a permanent operating tool of railroad police of the two lines.

Reynolds, WF *FBI Law Enforcement Bulletin* Vol. 43 No. N8, Aug. 1974, pp 16-21

ACKNOWLEDGMENT: Department of Justice  
ORDER FROM: Department of Justice National Criminal Justice Reference Service, Washington, D.C., 20531

24 139436

**TRANSPORTATION POLICY OPTIONS: THE POLITICAL ECONOMY OF REGULATORY REFORM**

This Proceedings of a conference on the Economic Regulation of Surface Transportation, which was sponsored by the Public Interest Economics Foundation, is divided in five parts: An Evaluation of Transportation Regulation; The Hows and Whys of Regulatory Reform; Alternatives to Current Transportation Policies; Transportation Reform Policies; and Epilogue. The National Conference on Surface Freight Transportation, the event upon which this book is based, was intended to analyze the regulation of domestic surface freight transportation. Although much has been written, the interest groups and decision makers most active in resolving the present deregulation controversy were essentially unfamiliar with earlier work. The Conference sought to place politically "five" policy options in the context of the substantial body of disinterested analysis.

Public Interest Economics Foundation No Date, 188 pp

ORDER FROM: Public Interest Economics Foundation 1714 Massachusetts Avenue, NW, Washington, D.C., 20036

24 139437

**RESEARCH ANALYSIS OF FACTORS AFFECTING TRANSPORTATION OF COAL BY RAIL AND SLURRY PIPELINE. VOLUME I.**

This study evaluates the factors affecting, or affected by, alternative modes of coal transport from a broad policy viewpoint, taking account of the potential overall direct and indirect effects of movement by specialized carrier (pipelines) in place of a common carrier (railroads). Each transport means is first treated individually with relevant information on slurry pipelines and unit trains being presented for reference without regard to competitive systems. Thinking of others is then drawn together to present a comparative picture. Finally an analysis presents the conclusions of the authors. Recommendations for future study of unresolved issues are given. Conclusions involving direct costs and socio-economic effects are made.

Prepared under a grant from Burlington Northern, Inc., St Paul, Minnesota.

Armbruster, FE Candela, BJ  
Hudson Institute Final Rpt. HI-2409-RR, Apr. 1976, 155 pp, 32 Fig., 25 Tab., 70 Ref.

ORDER FROM: Hudson Institute Quaker Ridge Road, Croton-on-Hudson, New York, 10520

DOTL RP

24 139438

**RESEARCH ANALYSIS OF FACTORS AFFECTING TRANSPORTATION OF COAL BY RAIL AND SLURRY PIPELINE. VOLUME II. APPENDIX**

Volume II, an Appendix document, contains detailed research into the slurry water availability issue, employment, and increased freight movement by truck resulting from elimination of railroads. A review of anticipated coal movements on waterways is also offered.

See also Volume I, Research Analysis of Factors Affecting Transportation

of Coal by Trail and Slurry Pipeline, RRIS 24 139437.  
 Armbruster, FE Candela, BJ  
 Hudson Institute Final Rpt. HT-2409-RR, Apr. 1976, 48 pp, 30 Fig., 25  
 Tab., 32 Ref.

ORDER FROM: Hudson Institute Quaker Ridge Road, Croton-on-Hudson,  
 New York, 10520

DOTL RP

24 139439

## TECHNOLOGY AND REVIVING THE RAILROADS

The five-fold increase in the R&D budget of the Association of American Railroads over a four-year period to \$4 million in 1975 and a simultaneous increase in the federal rail R&D budget to \$61 million in fiscal 1976 is reflected in increased activity on many fronts. The author predicts that technological change in the railroad industry should accelerate and then gives a general overview of the specific areas that are being investigated. Included are motive power, car designs, operating strategies, intermodal operations, yard operations, control and communications, automatic car identification and intercity and commuter passenger services. Energy conservation and increased use of computers are seen as of particular significance.

Ward, EJ *Technology Review* Vol. 78 N July 1976, pp 27

ORDER FROM: Technology Review Room E19-430, Massachusetts Institute of  
 Technology, Cambridge, Massachusetts, 02139

DOTL JC

24 139475

## THE OBJECTIVES ASSIGNED TO SOVIET RAIL TRANSPORT RESEARCH WORKERS FOR THE TENTH FIVE-YEAR PLAN-1975-1980 [Zadaci ucenyh zeleznodoroznogo transporta v desjatoj pjattletke]

No Abstract. [Russian]

Karetnikov, AD *Vestnik Vniizt* Vol. 35 No. 2, 1976, pp 1-5

ACKNOWLEDGMENT: International Union of Railways, BD  
 ORDER FROM: Vestnik Vniizt 3-aya Mytishchinskaya ul. 10, Moscow I-164,  
 USSR

24 139500

## TECHNOLOGY OF THE MODERN RAILWAY

Railways today are very much the focus of critical public interest. Is the railway age coming to an end? What should be the role of technology in the present situation of the German Federal Railway? What solutions can technology offer now and in the future? The author seeks to answer these questions in respect to track, vehicles, energy and information technology. Future development and research projects are examined, and the need for co-operation on a European level is emphasized. [German]

Lehmann, H *Eisenbahntechnische Rundschau* Vol. 25 No. 1/2, Jan. 1976,  
 9 pp

ACKNOWLEDGMENT: British Railways  
 ORDER FROM: Hestra-Verlag Holzfoallee 33, 61 Darmstadt, West Ger-  
 many

DOTL JC

24 139937

## PRELIMINARY STANDARDS, CLASSIFICATION, AND DESIGNATION OF LINES OF CLASS I RAILROADS IN THE UNITED STATES. VOLS. 1,2 AND ADDITIONS AND CORRECTIONS

This three-part report begins a series of studies mandated by Congress under various sections of the Railroad Revitalization and Regulatory Reform Act of 1976 to determine the best means for rehabilitating and revitalizing the nation's railroads. It is produced in accordance with Section 503(b) and is intended to provide a means of classifying the lines of the Class I railroads of the U.S. to serve a number of purposes under the Act. The prime purpose is to categorize the lines according to reasonable measures of priority so that investments in track can be directed where they will do the most good. Standards used by DOT for priority include traffic density, service to major markets, levels of capacity and national defense. Volume I established a preliminary set of categories and designation for public review, and contains

three appendices. Volume II has individual line designations by state and a national map. Additions and corrections are in a separate pamphlet.

Submitted in accordance with section 503 of the Railroad Revitalization and Regulatory Reform Act of 1976 (P.L. 94-210).

Office of the Secretary of Transportation Aug. 1976, 16 pp, Apps.

ORDER FROM: Government Printing Office Superintendent of Documents,  
 Washington, D.C., 20402

DOTL RP

24 139958

## VALUATION REPORTS OF PROPERTIES SUBJECT TO THE REGIONAL RAIL REORGANIZATION ACT OF 1973

The properties of the seven bankrupt lines transferred to Consolidated Rail Corp. under the Regional Rail Reorganization Act of 1973 on April 1, 1976, were required to be assigned a "new liquidation value" under the Final System Plan prepared by the United States Railway Association. USRA and four consultants performed specific phases of the process and this report summarizes the individual efforts and presents a consolidated valuation. The basis is a scenario of steps the involved railroads would have taken and the timing of those steps if all were to set about abandoning all rail operation and dismantling and liquidating all rail properties. Involved are rolling stock, materials and supplies, facilities, land and buildings, and operating agreements, leases and other administrative assets. New liquidation value was \$685 million with details of calculations given.

United States Railway Association Mar. 1976, 275 pp, Apps.

ORDER FROM: United States Railway Association 2100 2nd Street, SW,  
 Washington, D.C., 20595

DOTL

24 141125

## PROCEEDINGS OF A SEMINAR ON RESEARCH AND INNOVATIONS IN GUIDED GROUND TRANSPORT

This Proceedings is of a conference aimed at research and innovation in guided ground transport. Contents: Energy Trends and Their Effect on Transportation Models; An Analysis of the Rail Distribution of Natural Gas; Future Railway Research; Direct Recording of Rail-Wheel Parameters; An Observational Study of Road-User Behaviour at Railway Crossings; A Linear Synchronous Motor for Electro-dynamically-Levitated Vehicles; The Canadian Freight Transport Model Project; Decentralizing Control for Multi-Locomotive Powered Trains; Laboratory Performance of Railroad Ballast; A Data Acquisition System; Improvement of Automatic Coupling-Up Performance in Marshalling Yards; Innovations in Guided Ground Transport; Railway Safety and Its Research Needs; Electrification: Status Report and Future Outlook; Magnetic Levitation and Linear Motor for Ground Transportation; Urban Guided Ground Transportation; Transportation or Communications?

Proceedings, Canadian Institute of Guided Ground Transport Seminar,  
 Queen's University, Kingston, Ontario, Canada, 16-17, 1974.

Ganton, TD MacDonald, JA  
 Canadian Institute of Guided Ground Transport Proceeding CIGGT  
 Rept. N. 75-1, Nov. 1974, 406 pp, Figs., Tabs., Photos., Refs., 1 App.

ACKNOWLEDGMENT: CIGGT  
 ORDER FROM: CIGGT

DOTL RP

24 141135

## PROCEEDINGS OF A SEMINAR ON TRANSPORTATION RESEARCH AND EDUCATION, 7 AND 8 FEBRUARY 1972

This seminar was to establish communication between university researchers and potential users such as railways and to look at broad relationships between transportation education and transportation research. Contents: Magnetic Levitation and Linear Motor for Guided Ground Transportation; Guided Radar for Obstacle Detection in Guided Ground Transportation; The Arctic Railway; New Perspectives in Transportation Energy; University of Toronto/York University Joint Program in Transportation; A Communications System for Long Trains; Research on the Performance of Railroad Fills; Longitudinal Steady State Control of Multi-Locomotive Powered Trains; Lateral Vibration in Long Trains; A Network Flow Model for Mainline Rail Freight; The Transportation Centre at UBC and Its Role.



Canadian Institute of Guided Ground Transport Aug. 1972, 166 pp, Figs., Refs.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

24 141433

**COMPREHENSIVE AREAWIDE RAILROAD CONSOLIDATION AND RELOCATION STUDY--ST. LOUIS REGION, VOLUME 1-ALTERNATIVE RAILROAD RELOCATION PLANS**

This report on "Alternative Railroad Relocation Plans" for the Comprehensive Areawide Railroad Consolidation and Relocation Study-St. Louis Region contains the analyses and descriptions of three alternative plans for the relocation and/or consolidation of railroad facilities in the St. Louis region. The methodology for determining the costs and benefits to the railroads for each alternative is included as well as the philosophy employed and the assumptions made in the selection and adoption of the alternatives. Economic results are presented for each alternative as well as transit time and reliability, shipper benefits, and the significance of the alternatives to the national rail problem. This report is supported by 18 individual railroad reports which are only available on a "need-to-know" basis.

First of a six-volume study sponsored by the FRA, DOT; see also V2 RRIS 20 141434; V3, 20 141435; V4, 15 141436; V5, 25 141437; V6, 15 141438. Co-authors of this report: Parsons, Brinckerhoff, Grotz and Eric Hill.

East-West Gateway Coordinating Council Final Rpt. EWG-PB-0268.10.0, June 1974

Contract DOT-FR-20023

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL HE1613.S2P28, DOTL NTIS

24 141576

**THE CASE FOR SINGLE-LINE IMMUNITY**

Among the controversial features of rate bureaus or rate conferences as they exist in the regulated rail and motor carrier segments of the domestic transportation industry is authorization to discuss single-line rates with immunity from antitrust action. It is explained that elimination of single-line immunity could seriously hamper joint ratemaking since the single-line and joint rates are so interrelated. Conferences on joint rates could hardly avoid discussion of single-line rates. There is no evidence that rates would fall and that rate setting procedures would be speeded. There is no widespread attitude among shippers that exemption from immunity is beneficial and could destroy stability and uniformity of rate levels.

Davis, GM (Arkansas University, Fayetteville); Sherwood, CS (Eastern Kentucky University) *ICC Practitioners' Journal* Vol. 43 No. 6, 1976, pp 740-747

ORDER FROM: Association of Interstate Commerce Comm Pract 1112 ICC Building, Washington, D.C., 20423

DOTL JC

24 141637

**RESTRUCTURING THE RAILROADS OF THE UNITED STATES**

This is the first part of a conference report and is based on panel presentations and group discussions dealing with the restructuring of the US railroads and their relationship to other transport modes. The four presentations included: (1) The U.S.R.A. Plan for Restructuring the Railroads of the Northeast-Midwest Region; (2) Evaluation of USRA's Final System Plan; (3) Amtrak's Role in the Restructured Rail System; (4) Major Problems Facing the Nation's Railroads. The ensuing discussion of these subjects is then summarized.

Hagen, JA (United States Railways Association); Weller, J (Interstate Commerce Commission); Andringa, C (Amtrak); Briggs, R (Association of American Railroads); Meyers, MS (Environmental Protection Agency); Ouellette, RA (General Motors Corporation); Mueller, EA (Jacksonville Transportation Authority); Gallagher, TN (Air Transport Association of America) *Traffic Quarterly* Vol. 30 No. 2, Apr. 1976, pp 167-239, Figs., Tabs.

ORDER FROM: ESL

24 141687

**WHAT RAIL CONGLOMERATES DO FOR THEIR RAILROADS**

Section 903 of the Railroad Revitalization and Regulatory Reform Act of 1976 requires that the Interstate Commerce Commission undertake a study "of conglomerates and of such other corporate structures as are presently found" in the railroad industry. Ex Parte 323 is to produce the ICC report "with appropriate recommendations" for Congress early in 1977. ICC has contended that conglomerates are milking their rail subsidiaries and that it should have new regulatory powers over conglomerates. This article discusses the reasons for conglomerates, how they work, and how they help the industry. A survey of railroad-based conglomerates discusses many facets of this financial and regulatory enigma.

*Railway Age* Vol. 177 No. 18, Sept. 1976, 4 pp, 3 Phot.

ORDER FROM: ESL

DOTL JC

24 141691

**DOT READY TO GET MOVING ON \$1.9-BILLION CORRIDOR UPGRADING**

The Northeast Corridor traverses 8 states having 20% of the U.S. population at densities of 1000 people per square mile. Under the Railroad Revitalization and Regulatory Reform Act of 1976, \$1.75 billion of federal funding is to produce 2-2/3 hour schedules between Washington and New York and 3-2/3 hour schedules between New York and Boston by 1981. Additional funding with matching state input will rebuild passenger stations. Studies have shown the rail improvement program the most economical and environmentally acceptable solution to easing increasing congestion of the highway and air modes in the Corridor. The \$1.9 billion will include \$244 million for track improvements, \$326 million for realignments, \$345 million for bridges, \$35 million for tunnels, \$245 million for electrification, \$170 million for signaling/communications, \$120 million for shops, \$315 million for stations and \$100 million for fencing.

Sawyer, KT *Railway Age* Vol. 177 No. 19, Oct. 1976, 3 pp, 1 Tab.

ORDER FROM: ESL

DOTL JC

24 142281

**THE GERMAN FEDERAL RAILWAY DURING THE SECOND HALF OF THE 1970'S-PROBLEMS, AND HOW THEY CAN BE OVERCOME**

The author briefly reviews the current economic situation at the DB where the growing deficit at the end of 1975 rose sharply compared with previous years. He then analyses the causes of this increase, lists the measures taken to date and explains the solutions proposed to remedy the situation.

Lehmann, H *Rail International* No. 7, July 1976, pp 363-374

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

24 142628

**THE RAILWAY INDUSTRY--WHERE NEXT?**

This article discusses the railroads' inadequate earnings picture and notes that despite recent government intervention the roads are still in trouble because of rigid rate structure, heavy subsidies to other modes and costly labor contracts. Solutions to date have been inadequate and the author sees little potential in mergers and abandonments. He recommends revamped labor contracts, freedom in rate making and permanent subsidy for deficit lines whose retention is justified. While recommendations for imposition of inland waterway user charges, restriction on coal slurry pipe lines and no further increase in truck weight limits might seem to be measures to restrict progress, it is observed that society must decide whether it wishes to preserve a relatively efficient overall low-cost rail transport system with little or no subsidy and minimum pollution and highway congestion, even though it sacrifices some cost reductions on special services.

Due, JF (Illinois University, Urbana) *Challenge* Vol. 19 No. 5, Nov. 1976, pp 12-18

ORDER FROM: International Arts & Sciences Press, Incorporated 901 North Broadway, White Plains, New York, 10603

24 142944

**SOME OBSERVATIONS ON IMPROVING RAILROAD PRODUCTIVITY**

The 1973 report, *Improving Railroad Productivity*, is contested on three major points. Rather than declining, the movement of traditional rail-moved commodities in the Northeast and Midwest region increased after 1963 and railroads failed to retain their share. Intermodalism is seen as having little potential because motor carriers are unlikely to participate since it means loss of control over shipments and because pick up and delivery in major market areas is extremely high. While transcontinental rail systems are proposed, much of the region's traffic is intraregional and the proportion of transcontinental traffic is relatively small. The author calls for new examination of rail planning process.

Presented at the Seventeenth Annual Meeting of the Transportation Research Forum, *Beyond the Bicentennial: The Transportation Challenge*, held in Boston Massachusetts, October 28-30, 1976.

Allen, WB (Pennsylvania University, Philadelphia)

Cross (Richard B) Company Proceeding 1976, pp 457-68, 6 Tab.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

24 142945

**RAILROAD WORK RULES AND NEW TECHNOLOGY: TRAIN AND ENGINE SERVICE EMPLOYEES**

This paper is a preliminary investigation of several restrictive rules in the contracts of the train and engine service unions and their consequences on the operations of railroads. The work rules have affected productivity. Union leaders will not agree to any changes possible with today's technology. Management has reacted by making further capital improvements. Substitution of capital for labor is often counterproductive because better service might be provided without so much automation. Work rules must be changed to function better in today's environment; without improvement the future could be disastrous.

Presented at the Seventeenth Annual Meeting of the Transportation Research Forum, *Beyond the Bicentennial: The Transportation Challenge*, held in Boston, Massachusetts, October 28-30, 1976.

Kemp, PS, Jr (Harvard University)

Cross (Richard B) Company Proceeding 1976, pp 513-520, Tabs.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

24 142946

**CAPITAL REQUIREMENTS IN THE RAILROADS--THE NEXT TWENTY YEARS**

While past decades have seen vast investment in transportation facilities with no apparent concern for coordination of modes, setting of priorities or assessing long-range impacts on the environment and fuel supply, the growing shortage of capital is forcing reappraisal. The author examines transportation challenges facing Canada over the next two decades, predicting that a large proportion of traffic and exports will continue to be based on natural resources which create low-value bulk commodities that need low-cost overland transport which rail is best able to provide. He describes Canadian National's predictive processes, noting that governments have taken over much of the decision making that was previously in the hands of those who owned capital. He calls for prompt decision on resource development in order that transport facilities can be in place.

Presented at the Seventeenth Annual Meeting of the Transportation Research Forum, *Beyond the Bicentennial: The Transportation Challenge*, held in Boston, Massachusetts, October 28-30, 1976.

Spicer, JH (Canadian National Railways)

Cross (Richard B) Company Proceeding 1976, pp 551-54

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

24 142947

**RAIL CAPITAL--WILL THERE BE SUFFICIENT?**

The planning of Canadian Pacific for future investments is increasingly related to government decisions. Among the reasons are government involvement in construction of facilities in which there is no direct means of recovering the costs from users, in provision of facilities which are provided at less than cost, in establishing policies that can impose transport demands on private sector segments unable to finance expansion, and on regional planning which can require noncompensatory services. The short-and

long-range processes are briefly described, along with the predicted availability of capital.

Presented at the Seventeenth Annual Meeting of the Transportation Research Forum, *Beyond the Bicentennial: The Transportation Challenge*, held in Boston, Massachusetts, October 28-30, 1976.

Joplin, AF Detmold, PJ (Canadian Pacific)

Cross (Richard B) Company Proceeding 1976, pp 555-59, 2 Fig.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

24 142948

**A STATISTICAL ANALYSIS OF THE CANADIAN RAILWAY RATE STRUCTURE**

Insight into changing structures of freight rates can be obtained by applying regression analysis to waybill data. Conclusions must be viewed within limitations of the data and of regression analysis. On the basis of the waybill data, it is concluded that only general trends and general orders of magnitude are represented in coefficients reported. Regression analysis measures statistical and not causal relationships. Even with these shortcomings, it is concluded that Canadian Railway pricing practices have been consistent nationwide in their response to cost levels and competitive forces. After the 1950's, the freight rate structure became more cost oriented. Statistical analysis of waybill data is a means of throwing light on policy issues.

Presented at the Seventeenth Annual Meeting of the Transportation Research Forum, *Beyond the Bicentennial: The Transportation Challenge*, held in Boston, Massachusetts, October 28-30, 1976.

Heaver, TD Oum, TM (British Columbia University, Canada)

Cross (Richard B) Company Proceeding 1976, pp 570-578, 3 App.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

24 144074

**RAIL CAR ROUTING POLICIES AND PRACTICES**

This paper observes that car supply is a matter of more than sheer numbers. Different factors control routes which shippers specify and railroad/shipper interaction involves still other factors. Among those are the following: Promoting good relations with originating and terminating carriers; the effective net rate of special services; the dependability and speed of service; maintenance of competition on high-volume routes; loss and damage history; and personal factors. It is noted that shippers will generally accept routings with carriers which can assure adequate car supply even if additional transit time is necessary.

Coneybeer, T *Transportation Journal* Vol. 15 No. 4, June 1976, pp 29-38

ORDER FROM: American Society of Traffic and Transportation 547 West Jackson Boulevard, Chicago, Illinois, 60606

DOTL JC

24 145002

**TRB RAIL ACTIVITIES**

This article summarizes the railroad activities of the Transportation Research Board over the last four years, including the Railroad Research Information Service, the Railroad Research Study, and the work of the TRB committees in the rail transport area. These committees are in the areas of Surface Freight Transport Regulation, Intermodal Freight Transport, the State Role in Rail Transport, Electrification Systems, and Track Structure Systems Design.

Seamon, JH *Transportation Research News* No. 67, Nov. 1976, pp 12-15, 3 Phot.

ORDER FROM: TRB Publications Off

DOTL JC

24 145133

**EVALUATION REPORT OF THE SECRETARY OF TRANSPORTATION'S PRELIMINARY CLASSIFICATION AND DESIGNATION OF RAIL LINES**

This evaluation of the DOT Preliminary Standards, Classification, and Designation of Lines of Class I Railroads in the United States was submitted in compliance with a requirement of the 4R Act. The principal conclusion of the ICC Rail Services Planning Office is that the Report does not

designate an essential rail transportation system adequate to efficiently and economically serve the Nation's rail transportation needs because financial and consolidation policy considerations were imposed on the classification and designation process and because the economic viability criteria specified by Congress were not applied. It was recommended that the proposals be revised to give a national railroad system which conforms to the goals and policies enunciated by Congress. This would mean definite designations for all lines considered essential to an interstate rail system and minimum roadway standards for lines with the highest classification once a national system is designated.

Ex Parte No. 329, Review of DOT's Preliminary Classification and Designation of Rail Lines: a report submitted to the Secretary of DOT.

Interstate Commerce Commission Dec. 1976, 69 pp, Figs., 7 Tab., 2 App.

ACKNOWLEDGMENT: Interstate Commerce Commission  
ORDER FROM: Interstate Commerce Commission Rail Services Planning Office, 1900 L Street, NW, Washington, D.C., 20036

DOTL RP

24 145135

#### RAILROAD MANAGEMENT

Railroads were the first great organizational innovators of the 19th Century. The adaptive thinking and organizational creativity of that period were the first examples of contingency management theory. Stagnation saw an end of organizational adaptiveness in the first quarter of the 20th Century. The failure of railroad management is more with the system of development and organization than with the managers. Disparity between individual functional groups on railroads has led to a lack of perception of the need for improved coordination between operating and commercial functions. The great need is to redirect many top managers' attitudes to promote integration rather than condone functional jealousy. The author says conventional railroad organization is not particularly suitable for managing a large number of transactions over a geographically dispersed system. Only on lines with long line haul has the problem been concealed. Attempts to use the computer to centralize control have been less than successful and could better be performed by good local managers aided by better information systems. Railroads must be concerned with the transactional nature of their business.

Wyckoff, DD (Harvard University)  
Heath Lexington Books 1976, 194 pp, Figs., Tabs., Refs.

ORDER FROM: Heath (DC) and Company Department RS, 125 Spring Street, Lexington, Massachusetts, 02173

24 145170

#### THE CPR: A CENTURY OF CORPORATE WELFARE

In this counter-company history the author explains how the CPR has done it. He shows how the CPR's growth has come only as a result of continued favourable treatment from Ottawa, how it has managed to avoid government take-over while receiving enormous public subsidies, how it has been able to earn large profits, and how it has turned itself into a highly-diversified conglomerate involved in real estate, pulp and paper, mining, and oil as well as every form of transportation.

Chodos, R  
Lorimer (James) and Company, Publishers 1973, 178 pp, Figs., Tabs., Photos., Refs.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

24 145173

#### ANNUAL REPORT OF THE CANADIAN INSTITUTE OF GUIDED GROUND TRANSPORT. 1971-1972

This first annual report contains administrative reports on the organization's operations and in the appendices the progress reports on the following projects: A communications system for long trains; Signal processing for guided radar; Surface waveguides for guided radar obstacle detection in guided ground transportation; Track dynamics; Canadian Freight Transport Model summary report: Phase I; Improvement of automatic coupling-up performance in marshalling yards; Investigation of the stability and response of multi-car tracked vehicles; Control of multi-locomotive powered trains; A study of stresses and deformations under dynamic and static load systems

in track structure and support; Forecasting the demand for transportation services; Solid-state repeaters; Railway to the Arctic.

Canadian Institute of Guided Ground Transport June 1972, 108 pp, Figs., Refs., Apps.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

24 145174

#### ANNUAL REPORT OF THE CANADIAN INSTITUTE OF GUIDED GROUND TRANSPORT. 1972-1973

This second annual report contains administrative reports on the organization's operations and progress reports on the following research activities: A communications system for long trains; Guided radar for obstacle detection in guided transport systems: Signal processing aspects; Surface waveguides for guided radar and obstacle detection in guided ground transportation; Control of multi-locomotive power trains; Solid-state repeaters; A study of stresses and deformations under dynamic and static load systems in track structure and support; Track dynamics; Freezing problems during rail transportation; Effect of testing techniques on locomotive shop time and inventory; A simulation model for northern transportation planning; Canadian Freight Transport Model summary report: Phase II; Study of magnetic levitation and linear synchronous motor propulsion; An examination of the constitutional and intergovernmental aspects of a coordinated transportation policy in Canada; Arctic railway study.

Canadian Institute of Guided Ground Transport 1973, 174 pp, Figs., Tabs., Refs., Apps.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

24 145175

#### CIGGT ANNUAL REPORT. PART 2. FINANCIAL AND ADMINISTRATIVE REPORT 1973-74

This third annual report contains administrative reports on the organization's operations and brief progress reports on the following ongoing activities: Track/train dynamics; Maglev; Cybernetics and operational research; Arctic railway; Freezing programme; Motive power; Safety; Communications.

Canadian Institute of Guided Ground Transport CIGGT-74-5, 30 pp, 2 App

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

24 145176

#### ANNUAL REPORT OF THE CIGGT. 1974-1975. PART 1: RESEARCH PROGRESS

This fourth annual report of research progress describes the following projects: Train location via the communication technology satellite; Improvement of automatic coupling-up performance in marshalling yards; A study of stresses and deformations under dynamic and static load systems in track structure; Track dynamics; Direct recording of wheel-rail parameters; Evaluation of selected AAR recommendations for train handling; Canadian Freight Transport Model, Phase III; Application of data base management to establishing a transportation data bank; Railway terminal simulation modelling; Arctic gas and oil by rail; Superconducting magnetic levitation and synchronous motor propulsion; Structural design of Maglev guideway; Freezing problems; Observational study of road-user behaviour at railroad crossings; Diesel-electric locomotive performance during winter operations; A brief survey of rail safety technology; National transportation policy study--A survey of rail passenger transportation; The railway freight rate issue in Canada.

Law, CE  
Canadian Institute of Guided Ground Transport CIGGT-75-6, Mar. 1975, 305 pp, Figs., Tabs., Refs.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

24 145806

**LONG DISTANCE RAIL TRANSPORTATION. PART B: RAPID RAIL TRANSPORTATION USING WHEEL/RAIL TECHNOLOGY [Spurgeführter Fernverkehr. Teil B: Spurgeführter Fernverkehr mit Rad/Schiene-Technik]**

Status reports are presented on research and development in the Federal Republic of Germany. Topics are centered around wheel/rail technology. The subsystems track, vehicle, operations management, and environmental questions, as well as the rail dynamics simulator and a research vehicle, are discussed. Planned medium term activities for 1975 to 1979 are described. [German]

Seri-2. Conf-Proc. Of the Statusseminar, Schliersee, West Germany, March 12-14, 1975.

Federal Ministry for Research and Technology BMFT-FB-T-75-37-PT-B, Dec. 1975, 122 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

N76-28112/OST, DOTL NTIS

24 147587

**HEAVY TRAINS FOR TRANSPORT FROM MINES [Les trains lourds dans la desserte des exploitations minières]**

The author considers a typical phenomenon in rail transport: the construction during the last 20 years of heavy special-purpose industrial railways between mines and ports. Such railways have specific features: low cost, simple technical conditions, transport of millions of tons of ore. The trains are very heavy, up to 15,000 gross metric tons (12,000 net tons). As few trains run each day, single track will suffice, together with simplified fixed installations. The author then lists the different lines built or in the project stage and points out that there is much similarity between the projects from the railway technical standpoint, irrespective of where the lines are constructed. [French]

Broca, B *Revue Generale des Chemins de Fer* Oct. 1976, pp 579-594, 5 Fig., 1 Tab., 14 Phot.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

24 147589

**RAILWAYS ENTER AN ERA OF CHANGE**

This article discusses the problems which have plagued CN and CP Rail in recent years. It suggests solutions to the problems such as more modern facilities, better scheduling and rapid transit. It also looks at Light Rail Transit, the economic case for lightweight rolling stock, railway research in

Canada and the northern railway option.

*Engineering Journal (Canada)* Vol. 59 No. 2, Mar. 1976, 20 pp, Figs., Tabs., Photos.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: ESL

DOTL JC

24 147690

**THE RAIL GAME**

The author discusses the imbalance of Canadian transportation with its overemphasis on highways and airways, "and a neglect of railroads, which often operate with old equipment on poor-quality track and use obsolete facilities and operations procedures." Despite extensive documentation, the author does not establish the responsibility of management, labor, government or the public in Canada's continuing railroad problems.

A review of this publication appeared in *Trains*, Vol. 37, No. 4, February 1977, p 58.

Lukasiewicz, J

McClelland and Stewart Limited 1976, 302 pp

ORDER FROM: McClelland and Stewart Limited 25 Hollinger Road, Toronto, Ontario M4B 3G2, Canada

24 147899

**THE TRUTH ABOUT SPEEDLINK ... OR IS IT?**

The proposal for Speedlink, a second generation of British Railways intermodal freight service developed by BR's R&D Division, has been killed by the operating department. This advancement of the Freightliner concept was a response to environmental and commercial pressures to get freight back on the railways. It would have involved 200 small depots, each with a simple gravity transfer system, clustered around 20 major computerized and automated sorting facilities. These would be connected by Freight Multiple Unit (FMU) trains making frequent, speedy trips handling containers between the various installations. The reasons for reluctance of BR management to endorse the proposed system and the future of BR research activities are discussed. If Speedlink is not profitable, extension of the cost estimating techniques would seem to indicate that no BR freight traffic is. This report sees BR management unwilling to compete seriously for any freight business which involves matching the road haulers' intensive utilization of capital and manpower.

*Railway Gazette International* Vol. 132 No. 12, Dec. 1976, 3 pp, 2 Fig., 2 Tab., 8 Ref.

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DOTL JC

25 131926

**URBAN RAILROAD RELOCATION: NATURE AND MAGNITUDE OF THE PROBLEM**

This report, the fourth in a series of four volumes produced on urban railroad relocation, describes the nature of the urban railroad location problem and estimates its magnitude nationwide. Costs of urban railroad/highway conflicts are estimated at \$800 million annually to highway users in delays and increased running costs, and \$185 million in accidents. Annual railroad costs are estimated at \$75 to \$100 million for slowing and accelerating trains in urban areas and \$70 million for maintenance of grade crossing surfaces, marking, and warning devices. Community costs from environmental degradation, barrier effects, and incompatible land uses are high but difficult to quantify without detailed site studies. About two-thirds of the 2,500 communities with railroads in the U.S. with populations over 5,000 in 1970 show evidence of serious railroad conflicts that might be ameliorated by some combination of the following measures: consolidation or relocation of railroad lines; closing of dangerous, low, volume crossings; installation of improved crossing surfaces and warning devices; construction of grade separation structures (including elevated or depressed railroad sections); and encouragement of compatible community development. Programs are outlined for major relocations or consolidations in an estimated 600 to 1100 communities, at a cost of up to \$2.8 billion, that would return between \$4 and \$4.4 billion in present value of reduced highway user, railroad, and community costs. The need for Federal and State support of such a program is explored.

Sponsored by the Federal Railroad Administration, Federal Highway Administration, DOT. This is Volume 4 of a 4 Volume set.

Moon, AE

Stanford Research Institute, Federal Railroad Administration, Federal Highway Administration, (SRI 2070) Final Rpt. RP-31 Volume 4, Apr. 1975, 166 pp, 12 Fig., 44 Tab., 4 App.

Contract DOT-FR-20037

ACKNOWLEDGMENT: FRA, NTIS

ORDER FROM: NTIS

PB-251176/4ST, DOTL NTIS

25 133223

**GUIDELINES FOR CONDUCTING SURVEYS CONCERNING TRANSPORTATION**

The purpose of the study is to produce guidelines that provide specific, operational and action oriented assistance to those responsible for planning and implementing transportation surveys as a community involvement tool. A considerable amount of recent transportation survey experience along with the provision of technical information from private urban opinion survey organizations was researched and analyzed for inclusion in these guidelines. By discussing and comparing the relative merits of different survey techniques, the sampling process, questionnaire design, and examples of past surveys, these guidelines cover the theoretical as well as the practical side of the surveying process. The presentation of this information is in such a form that it can be used by field staff to insure that this vital element of a community involvement program can be performed in an efficient and effective manner.

Washington State Department of Highways, Federal Highway Administration, (WASH-HR-527) Final Rpt. RPR-253, Sept. 1975, 70 pp

ACKNOWLEDGMENT: NTIS

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PB-251573/2ST, DOTL NTIS

25 133228

**BART IMPACT PROGRAM. PUBLIC POLICY PROJECT: RESEARCH PLAN**

The report defines the scope of the Public Policy Project, identifies specific research issues, and outlines methods for performing the work. A theoretical framework encompassing the various anticipated public policy impacts outlines the impact process and defines the basic concepts used in formulating the research approach. The Work Elements describing the specific work to be done are closely tied to the research issues identified in the theoretical framework. Details of data collection and analysis are contained in the Work Elements. The Research Plan outlines how the work

will be performed by proposing a preliminary schedule, staffing requirements and estimates of level of effort.

Bain, H Lyons, F

Metropolitan Transportation Commission, Department of Transportation, Department of Housing and Urban Development PD-22-8-76, Apr. 1976, 49 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

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PB-251697/9ST, DOTL NTIS

25 134865

**DESCRIPTION AND APPLICATION OF A COMPREHENSIVE PLANNING PROCEDURE FOR URBAN RAILROAD RELOCATION**

Relocation for consolidation of railroad facilities in urban areas offers a potential for achieving significant benefits from eliminating delays and accidents at grade crossings, environmental degradation near the railroad, and social and economic barriers and from improving the efficiency of railroad operations. However, the impacts of railroad relocation are distributed widely throughout a community, and any real improvement in the community and railroad system will require careful and comprehensive planning. This paper describes a planning procedure and guidebook developed to help community leaders organize and manage the planning process and to provide a consistent framework for developing and analyzing the costs and benefits of alternatives. The project team found that the analytical procedure was effective when used at the proper level of detail to support the decisions to be made as a result of the current study. They also found that the evaluation of projects with significant nonmonetary benefits is difficult, despite the organization of the benefits that can be valued or measured. This paper illustrates the application of these procedures and the guidebook to the problem of railroad relocation in the city of Lafayette, Indiana.

Report prepared for the 54th Annual Meeting of the Transportation Research Board.

Moon, AE (Stanford Research Institute) *Transportation Research Record* No. 562, 1976, pp 15-27, 2 Fig., 8 Tab.

ORDER FROM: TRB Publications Off

25 137419

**ANALYSIS OF FISCAL YEAR 1977 DOT PROGRAM BY POLICY AND RD AND D MANAGEMENT OBJECTIVES. PROGRAM LEVELS FOR FISCAL YEARS 1975, 1976, 1977. VOLUME 1**

The analysis of the DOT budget requests for Fiscal Year 1977 is presented in terms of its relationship to DOT policy and RD&D objectives. These objectives are: (1) modernize regulation and legislation, (2) increase efficiency and service, (3) improve safety and security, (4) lessen unfavorable environmental impacts, (5) minimize adverse impacts on energy constraints, and (6) increase knowledge base. The total budget of \$14.1 billion contains \$367.7 millions for RD&D or about 2.6% of the total. The document consists of two volumes. Volume 1 contains narrative and fiscal descriptions of line item requests. Volume II provides tables and analyses from differing management perspectives.

See also PB-243 700.

Federal Highway Administration Mgmt Rpt. DOT-TST-76-69.1, June 1976, 218 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-255401/2ST

25 137420

**ANALYSIS OF FISCAL YEAR 1977 DOT PROGRAM BY POLICY AND RD AND D MANAGEMENT OBJECTIVES. PROGRAM LEVELS FOR FISCAL YEARS 1975, 1976, 1977. VOLUME 2**

Contents: RD&D management program analyses; Policy and management program analyses; Transportation safety program analyses. Portions of this document are not fully legible.

See also PB-255 401.

Department of Transportation Mgmt Rpt. DOT-TST-76-69.2, June 1976, 553 pp

ACKNOWLEDGMENT: NTIS  
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PB-255402/0ST, DOTL NTIS

25 137436

**PROCEEDINGS OF THE URBAN MASS TRANSPORTATION ADMINISTRATION/AMERICAN PUBLIC TRANSIT ASSOCIATION RESEARCH AND DEVELOPMENT PRIORITIES CONFERENCE HELD AT ARLINGTON, VA. ON FEBRUARY 19-20, 1976**

The document contains the material that was presented at the Urban Mass Transportation Administration/American Public Transit Association Research and Development Priorities Conference. The papers specifically address the following aspects of urban transportation research and development: bus and paratransit technology; rail transit technology; new systems and automation; socioeconomic research and special projects; service and methods demonstrations; priorities and balance in UMTA research and development; delivery systems for putting results of research and development into service; transit management; and planning methodology.

American Public Transit Association, Urban Mass Transportation Administration, (UMTA-DC-06-0136) UMTA-DC-06-0136-76-1, May 1976, 131 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255898/9ST, DOTL NTIS

25 138066

**THE PUBLIC RESPONSE TO THE SECRETARY OF TRANSPORTATION'S RAIL SERVICES REPORT-MIDWESTERN STATES**

A restatement in condensed form of testimony submitted by midwesterners in response to the Secretary of Transportation's report on rail services. The public hearings were held between March 4 and July 11, 1974 in Ohio, Indiana, Illinois, Michigan, and States beyond the region (Iowa, Kentucky, Missouri, Wisconsin).

Interstate Commerce Commission IC1.2:R 13/14/V.3, 1975, 264 pp

ACKNOWLEDGMENT: Government Printing Office  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

S/N 026-000-00996-1

25 138069

**EFFECTS OF PROPOSED NORTHEAST-MIDWEST RAIL REORGANIZATION ON RURAL AREAS**

No Abstract.

Prepared in cooperation with Agricultural Marketing Service, Dept of Agriculture and, Federal Railroad Administration. Dept of Transportation.

Economic Research Service Mar. 1975, 74 pp

ACKNOWLEDGMENT: Government Printing Office  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

Y4.Ag8/2:R 13/2

25 138070

**THE INTERSTATE COMMERCE ACT**

The text of the act, with supplementary acts and related sections of various other acts.

Interstate Commerce Commission IC 1 ACT 5:973, 1973, 716 pp

ACKNOWLEDGMENT: Government Printing Office  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

S/N 026-000-00915-4

25 138140

**FEDERAL TRANSIT OPERATING SUBSIDY OPTIONS**

This paper reviews the political and historical background of transit operating subsidies. The issue discussed is not whether there should be

operating subsidies, but rather which levels of government should provide them and in what fashion. Three arguments are reviewed: the fiscal, federal role, and pragmatic arguments. The fiscal argument is that the operating deficits of transit authorities represent a local government fiscal program and should be treated as such. The federal role argument states that federal operating subsidies would lead to an inappropriate degree of federal involvement in local government decision making. The pragmatic argument is that it would be extremely difficult to use federal operating subsidies as an effective tool for improving urban transit operations and that the subsidies carry a real chance of being counterproductive. This paper examines four categories of operating subsidy options: no operating subsidies, the pipeline approach (unrestricted flow of funds to the transit industry), the block grant approach (exemplified by the transportation revenue sharing bill and the federal-aid urban highway program in the 1973 highway act), and the quid pro quo approach (a grant program whereby specific quid pro quos in the form of definite improvements or innovations in an urban area transit system are demanded in return for federal subsidies).

Presented at the 54th Annual Meeting of the Transportation Research Board.

Beshers, EW (Department of Transportation) *Transportation Research Record* No. 573, 1976, pp 12-17

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25 138143

**WHAT PRIZES WHEN ONE SUBSIDIZES? SOME LESSONS FROM THE PAST**

This paper reviews past U.S. subsidy programs in both agriculture and transportation to establish facts about federal subsidies and apply these facts to current federal transportation subsidy programs. Two points are made. First, traditional transportation subsidies paid by the federal government have been justified in terms of national advantage. Based on this assumption, the case for federal subsidization of urban public transportation would be in extreme difficulty. This point primarily establishes reasons why urban transportation subsidies should not exist. There is, however, another approach, which leads to the second point that a new case for federal subsidization can be made strictly in terms of local advantage. An argument is presented for this new case.

Presented at the 54th Annual Meeting of the Transportation Research Board.

Nelson, JR (Amherst College) *Transportation Research Record* No. 573, 1976, pp 30-36

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25 138146

**LEGISLATIVE PERSPECTIVES ON THE STATE TRANSPORTATION PLANNING PROCESS AND TRANSIT PLANNING IN CALIFORNIA**

The state of California has created a multimodal Department of Transportation and has embarked on a major statewide transportation planning effort. Although the legislation gives much of the responsibility for planning to regional agencies in the major metropolitan area, both the California Department of Transportation and the California legislature have important roles in the first iteration of a plan to be developed by 1976. This paper points out several concerns that the legislature may pursue in reviewing and guiding the planning process. These concerns deal with the issues of goal setting, decision making, and conflict resolution rather than with the technical details of planning. Four concerns about multimodal planning are examined in this paper: (a) planning for operations versus planning for facilities; (b) corridor versus local travel needs; (c) planning bases in technical expertise and analytical technique versus public openness and broad participation; and (d) programming versus master planning. Because transit planning has been largely absent from past state-level transportation concerns, several conceptual transit planning issues are raised in this paper as well. Examples from the recent Los Angeles planning experience illustrate legislative interest in staged decision-making and multimode transit solutions.

Presented at the 54th Annual Meeting of the Transportation Research Board.

Burco, RA (Public Policy Research Associates) *Transportation Research Record* No. 563, 1976, pp 13-21, 4 Fig., 16 Ref.

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DOTL JC

25 138808

**DO OUR ROADS PAY?**

A description is given of the constraints, investments, incomes and expenditures of British road and rail systems. Factors affecting the railway deficit are considered including inflation, price control, recession and overmanning, and accounts for 1974 are given in tabular form. Road costs and revenues are calculated for a hypothetical "British roads board" using the sum of license and fuel duties as road revenue. Expenditure includes an estimate for noise, pollution and visual intrusion. It is concluded that the loss on the roads is comparable to that on the railways but it is admitted that much subjective judgement is involved. /TRRL/

Bispham, J (National Institute of Economic and Social Research) *Architects Journal* Vol. 163 No. 14, Apr. 1976, pp 681-83, 4 Tab., 2 Phot.

ACKNOWLEDGMENT:

ORDER FROM: Architects Press Limited 9 Queen Annues Gate, London SW 1, England

25 139491

**MASS TRANSPORTATION NEEDS AND FINANCING IN THE UNITED STATES**

States and localities would be able to carry the financial burden of mass transportation improvements, even if the proposed 1980 programs were implemented in their entirety, given current levels of Federal assistance. However, there would have to be a substantial financial commitment from the states and localities and some hard decision made by them about public expenditure priorities, fare policies, and taxation levels, and policies to discourage automobile usage. This underscores the need for careful review of their overall plans and programs by state and local officials before making financial commitments.

Weiner, E *Transportation (Netherlands)* Vol. 5 No. 1, pp 93-110

ACKNOWLEDGMENT: UIC

ORDER FROM: Elsevier Scientific Publishing Company P.O. Box 211, Amsterdam, Netherlands

25 139499

**A ROLE FOR TRANSPORTATION IN CANADA**

Transportation planning today involves all modes--airways, railways, waterways, and pipelines. Even the transmission of electrical power may be considered as a mode of transportation. Moreover, transportation planning involves the economic, political, and social systems of a nation. This paper is an attempt to create an awareness of the vast importance and complexity of transportation planning, to define a potential role of transportation, and finally, to suggest ways and means of achieving transportation's possible role.

Gratwick, J Fahey, WR Schneiderman, A *Long Range Planning* Vol. 9 No. 1, Feb. 1976, pp 38-43

ACKNOWLEDGMENT: British Railways

ORDER FROM: Pergamon Press, Incorporated Maxwell House, Fairview Park, Elmsford, New York, 10523

DOTL JC

25 139634

**DEVELOPING TRANSPORTATION AND LAND USE ALTERNATIVES IN TORONTO**

The Metropolitan Toronto Transportation Plan Review is discussed with special reference to public participation, developing transportation and land use alternatives, and the testing and evaluation of alternative systems. An attempt is then made to highlight some conclusions which may have general relevance to transportation planning in any urban area. The Toronto Review did not recommend a single transportation plan but described a number of alternatives for different development alternatives. An attempt was made to point out the degree of commonality associated with specific transportation decisions sufficient information was provided for each of the transportation components to evaluate their effectiveness and desirability in terms of the measures related to demand satisfaction, economics and other criteria. Based on the commonality aspects of specific transportation projects and the ways in which they contribute as part of an overall system to long-range

development objectives, individual transportation decisions were categorized into those that were neutral and those that had a high degree of impact on development. An attempt was also made to indicate how certain short-term improvements could be made to the existing transportation system in ways that would ensure that subsequent investment in major projects would produce the highest payoff possible in terms of effectiveness.

Proceedings of a conference held July 22-23, 1975, and sponsored by the Social, Economic, and Environmental Factors Section of the TRB and the School of Environment and Engineering of Cornell University.

Soberman, RM (Ontario Transportation Development Corporation) *Transportation Research Board Special Reports Conf Proc.* No. 168, 1976, pp 23-34, 5 Fig., 2 Tab., 5 Ref.

ORDER FROM: TRB Publications Off

25 139645

**DEVELOPMENT OF STATE RAILROAD PLANNING**

As a result of new federal legislation, a number of states have begun to develop railroad plans. This paper reviews the history of government planning for railroads in the United States, examines the requirements of present laws, and outlines primarily through reference to activities under way in Wisconsin what rail plan can contain and what rail planning might accomplish. Alternative futures for rail planning are then postulated. Included is a survey form pertaining to the major data-gathering effort in the Wisconsin plan--a detailed census of more than 11,000 business establishments in the state.

Prepared for the 54th Annual Meeting of the Transportation Research Board.

Fuller, JW (Wisconsin Department of Transportation) *Transportation Research Record Conf Rpt.* No. 577, 1976, pp 27-34, 1 Tab., 12 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

25 139947

**BOSTON: A SYSTEMS SOLUTION TO URBAN MASS TRANSPORTATION PROBLEMS**

This paper examines public mass transit solutions to increasing auto congestion and pollution in the Boston area. It attempts to measure the effectiveness of this solution and prescribe a modified course of action to deal with Boston's urban transportation problem. The recommitment to transit is called a disappointing failure, but transit is seen as the key ingredient to regional transportation problems.

Stephenson, FJ (Northeastern University) *ICC Practitioners' Journal* Vol. 43 No. 5, July 1976, pp 625-645, 2 Fig., 11 Tab.

ORDER FROM: Association of Interstate Commerce Comm Pract 1112 ICC Building, Washington, D.C., 20423

DOTL JC

25 139948

**SAFETY AND HEALTH REGULATION OF THE TRANSPORTATION INDUSTRY: CAN THE INDUSTRY SERVE TWO MASTERS?**

The imposition of health and safety regulation on the transportation sector started in 1893 with the Safety Appliance Act; the railroads thus became the first industry subjected to such Federal control. This article traces the evolution and expansion of such regulations to the recent imposition of Occupational Safety and Health Act (OSHA) regulation on transport agencies starting in 1973. There has arisen a jurisdictional controversy with the Federal Railroad Administration which previously had regulated all rail safety matters and the Department of Labor which is responsible for OSHA enforcement. The complications of undefined responsibility are described.

Edwards, CA *ICC Practitioners' Journal* Vol. 43 No. 5, July 1976, pp 614-624

ORDER FROM: Association of Interstate Commerce Comm Pract 1112 ICC Building, Washington, D.C., 20423

DOTL JC

25 141129

**TRADE IN COMMODITIES AND TRANSPORTATION SERVICES**

A two-country, three-commodity three-factor trade model is set out. One commodity is the output of transportation services. These services are



tradable, produced with a production function distinct from those used by the other two (final) commodities between countries. Stolper-Samuelson relations on the changes of world commodity prices are set out. The Kuhn-MacKinnon fixed point algorithm is used to numerically solve the two-country model for purposes of illustration. Transportation subsidies are introduced and the example is resolved. The welfare costs of the subsidies are measured.

Hartwick, JM

Canadian Institute of Guided Ground Transport, (Proj. No. 4.31.75) No. 75-8, 1975, 25 pp, 2 Fig., 5 Tab., 12 Ref.

ACKNOWLEDGMENT: CIGGT

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DOTL RP

25 141281

**METROPOLITAN TRANSPORTATION PLANNING: PROCESS REFORM**

Shifting public values, increasing competition for public resources, and improved technical capabilities have rendered obsolete certain aspects of the conventional regional transportation planning process. Several recent regional planning reviews and restudies have surfaced a new approach. This paper suggests how philosophy, organization, staffing, and technical approach can be balanced in a new process to incorporate the concern for long-range regional issues with short-range localized issues. The implications of such a restructuring of the planning process will be most dramatically felt in the redefinition of a plan as an open-ended document in response to the current status and future options for a continuing improvement program. /Author/

Prepared for the 54th Annual Meeting of the TRB held in Washington, D.C.

Hansen, WG (Voorhees (Alan M) and Associates, Incorporated);

Lockwood, SC *Transportation Research Record* Conf Paper No. 582, 1976, pp 1-13, 4 Fig., 12 Ref.

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DOTL JC

25 141285

**RAIL PLANNING: A STATE VIEWPOINT**

The purposes and objectives of the Regional Rail Reorganization Act of 1973; its planning requirements; and the planning efforts of the Pennsylvania Department of Transportation, other northeastern and midwestern states, and various federal agencies in response to that legislation are described. Also included are a description and criticism of the report of February 1, 1974, by the U.S. Department of Transportation in response to the rail reorganization act. Attention is focused on the 17-state Conference of States on Regional Rail Reorganization, its formation and purposes, and its adopted resolutions and positions on rail reorganization planning by the U.S. Railway Association. This paper concludes that federal rail planning is defective because it places undue emphasis on abandonment of excess trackage as the solution to the railroad problem and uses fully allocated system cost rather than avoidable costs for evaluation of branch-line viability. The paper points out that federal rail planning has given insufficient consideration to future potential of the rail mode in moving persons and goods and to energy, environmental, and social needs of communities for continued rail service. Attention is focused on the harmful effects on competition and efficiency that may arise if federal rail reorganization efforts lead to one large single reorganized entity serving the entire northeast-midwest region. /Author/

Prepared for the 54th Annual Meeting of the TRB held in Washington, D.C.

Kinstlinger, J (Pennsylvania Department of Transportation) *Transportation Research Record* Conf Paper No. 582, 1976, pp 50-60, 1 Fig., 2 Tab., 6 Ref.

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25 141287

**STATE-REGIONAL PARTNERSHIPS IN WISCONSIN TRANSPORTATION PLANNING**

This paper discusses institutional and process relationships between state-wide and regional transportation planning in Wisconsin. The organization,

administration, and programs of multicounty regional planning commissions are discussed in the context of their impact on planning programs of the Wisconsin Department of Transportation, particularly preparation of a state transportation plan. The paper describes the factors considered by the department Division of Planning in deciding to implement formal state-regional partnerships in transportation planning throughout Wisconsin. The alternative of providing coordinative support to regional planning commissions is also discussed. The conclusion is that these formal partnerships are providing substantial benefits for both statewide and regional land use and all-mode transportation system planning. These benefits, however, have not come without some problems and delays, particularly in the department's relationships with newly organized regional planning commissions. Even the new commissions, however, are finding that, although their initial interests may be more issue than system oriented, they can play a constructive role in statewide highway, airport, and rail system planning. /Author/

Prepared for the 54th Annual Meeting of the TRB held in Washington, D.C.

Wilson, BB (Wisconsin Department of Transportation) *Transportation Research Record* Conf Paper No. 582, 1976, pp 72-84, 3 Fig., 3 Tab., 5 Ref.

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25 141403

**ISSUE-ORIENTED APPROACH TO ENVIRONMENTAL IMPACT ANALYSIS**

An approach for better organization of significant portions of the urban transportation planning process is presented. A corridor-planning project from the Dallas-Fort Worth region in the form of an environmental impact analysis for a proposed urban tracked air-cushion vehicle facility is used as a case study. The issue-oriented approach is built on 3 broad concepts. First, the early identification and analysis of major impact issues in relation to regional or local goals and objectives should be a major element on which transportation planning studies are structured. Second, the planning and evaluation process should be phased, and each successive phase or cycle should address additional, more detailed service and impact variables, but for a smaller number of alternatives. Third, required environmental impact statements should be viewed as a reorganization of the results of environmental impact analyses already well integrated in the planning process.

Prepared for the 54th Annual Meeting of the TRB held in Washington, D.C.

Larwin, TF (Barton-Ascham Associates, Incorporated); Stuart, DG *Transportation Research Record* Conf Paper No. 583, 1976, pp 1-14, 5 Fig., 3 Tab., 14 Ref.

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25 141427

**BETTER INFORMATION NEEDED IN RAILROAD ABANDONMENTS: INTERSTATE COMMERCE COMMISSION**

The ICC abandonment procedure relies on outdated precedents which treat applicant railroads unfairly. The Commission does not recognize all costs associated with continued operation of the line proposed for abandonment. There is no uniform accounting system for determining branch line costs and evaluations are based on costs determined for an abandonment decided in 1939. The ICC breakeven criterion of 34 carloads per mile, determined from 39 abandonments decided during 1969-1970, is not representative of all applications. Consideration is not given to return on net salvage value as an avoidable cost and to depreciation of track structures as a cost. It is recommended that in responding to the Railroad Revitalization and Regulatory Reform Act of 1976, the ICC establish a uniform accounting system for branch line analysis, develop a fair breakeven standard, and provide for return on net salvage value and track depreciation in decision making.

General Accounting Office, (B-139052) CED-76-125, July 1976, 11 pp, 1 Ref.

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

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25 141429

**INNOVATION IN PUBLIC TRANSPORTATION: A DIRECTORY OF RESEARCH, DEVELOPMENT AND DEMONSTRATION PROJECTS, FISCAL YEAR 1975**

This annual publication contains descriptions of the current research, development and demonstration (RD&D) projects sponsored and funded by the U.S. Department of Transportation's Urban Mass Transportation Administration (UMTA). It is UMTA's policy to make available to the public as readily as possible information about research activities. The volume is divided into seven main sections: The Office of Research and Development; Bus Transit and Paratransit; Rail Transit; New Systems and Automation; Socio-Economic and Special Projects; The Office of Transit Planning; The Office of Transit Management. Appendices include a listing of project reports, all of which are available from NTIS and information about Federal grant and procurement contracts for Urban Transit R&D.

Urban Mass Transportation Administration 1975, 103 pp, Figs., Photos, 3 App.

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO-050014000061, DOTL RP

25 141435

**COMPREHENSIVE AREAWIDE RAILROAD CONSOLIDATION AND RELOCATION STUDY--ST. LOUIS REGION. VOLUME 3-REGIONAL PLANNING-DYLAM II**

This report on "Regional Planning-DYLAM II" describes the computer-aided land-use planning tool-the Dynamic Land-Use Allocation Model (DYLAM II)-which was used to project future land-use patterns in the St. Louis Region. These projections assist in the delineation of the future regional distribution of generated rail freight tonnages and will permit testing of the regional land-use impacts of relocation strategies. In addition, the Model provides a dynamic tool for examining the interplay of public policy and development decisions with land use. The methodology used to develop required input to the Model is discussed along with a description of the calibration process, the projection of land-use patterns, and a comparison of these projections with those of the East-West Gateway Coordinating Council.

See also V1 RRIS 24 141433; V2, 20 141434; V4, 15 141436; V5, 25 141437; V6, 15 141438. Co-authors of this report are Parsons, Brinckerhoff, Grotz and Eric Hill.

East-West Gateway Coordinating Council Final Rpt. Vol. 3 EWG-PB-0268.10.0, June 1974

Contract DOT-FR-20023

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25 141437

**COMPREHENSIVE AREAWIDE RAILROAD CONSOLIDATION AND RELOCATION STUDY--ST. LOUIS. VOLUME 5-"ORGANIZATIONAL ALTERNATIVES"**

This report on the "Organizational Alternatives" for the Comprehensive Areawide Railroad Consolidation and Relocation Study-St. Louis Region examines the question of selecting a lead agency for the implementation of a railroad relocation project. Existing regional and local agencies are examined from the standpoint of their legal, administrative and fiscal capacity to perform this function. The possibility of a single state agency being provided with the necessary powers and institutional arrangements used for similar projects elsewhere are explored as well as private approaches to the organizational question. A recommendation for the creation of a new "umbrella" agency using the existing Bi-State Development Agency as a foundation upon which to build is included.

See also V1 RRIS 24 141433; V2, 20 141434; V3, 20 141435, V4, 15 141436; V6, 15 141438. Co-authors of this report are Parsons, Brinckerhoff, Grotz and Eric Hill and the Research Group, Atlanta, Georgia.

East-West Gateway Coordinating Council Final Rpt. Vol. 4 EWG-PB-0268.10.0, June 1974

Contract DOT-FR-20023

240

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25 141556

**FEDERAL FUNDING OF RAIL REHABILITATION: A REVIEW OF ALTERNATIVE APPROACHES**

This study explores the proposed mechanisms for injecting federal funds into the rehabilitation of the fixed plant of U.S. railroads--that is, the roadbed, ballast, ties, signaling systems, yards and terminals that make up the physical rail system. The study accomplishes two specific tasks: (1) it identifies and describes selected alternative funding mechanisms in a way that facilitates comparisons among them, and (2) identifies key issues arising from the wide range of funding mechanisms and informally reviews the reactions to these issues of major parties at interest. This review is an assessment of rail transportation requested by the Subcommittee on Surface Transportation, Committee on Commerce, U.S. Senate.

The report is available on microfiche for reference purposes at DOTL. Prepared under contract by Harbidge House.

United States Congress OTA-T-11, Sept. 1975, 88 pp

Contract OTA C-25

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25 141557

**THE FINANCIAL VIABILITY OF CONRAIL. REVIEW AND ANALYSIS**

This report examines the financial outlook for ConRail, the railroad entity established under the Regional Rail Reorganization Act of 1973, using the background data developed by the United States Railway Association combined with inputs from key parties and independent analysts. Assessment is made of how the decisive factors in the following areas might be expected to develop between 1975 and 1985: (1) How fast ConRail revenues might grow; (2) Whether ConRail can reduce its operating expenses per unit of freight handled; (3) How much must be paid to acquire capital assets of the bankrupts and upgrade the plant to better and lower cost service. Possible outcomes are weighed in terms of three critical financial conditions: (1) What federal subsidy is needed to start and sustain ConRail? (2) It is realistic to plan on an income-based reorganization that would allow a shift from public to private ownership? (3) If ConRail were to encounter financial problems more severe than contemplated by USRA, what are the alternatives?

Prepared under contract by Energy and Environmental Analysis, Inc.

United States Congress Sept. 1975, 74 pp, 5 Fig., 30 Tab., 1 App.

Contract OTA-C-19

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DOTL HE2705.D14

25 141561

**THE COMMON CARRIER SYSTEM IN A MODERN ECONOMY-RESEARCH PROBLEMS**

Recent developments in economic analysis, statistical surveys and engineering systems research have made it possible to create new conditions for study of common carrier policy. Such studies are now well beyond the prototype stage and require definitive focus for best results. Such results could be achieved through legislative creation of a transportation research institution capable of assisting in the resolution of conflicts in the transportation field. Alternative models for such as organization exist, and there is sufficient experience to justify going ahead with the idea.

Nupp, B *Transportation Journal* Vol. 16 No. 1, Sept. 1976, pp 5-15, 2 Fig.

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25 141571

**REBUILDING THE RAIL INDUSTRY: FRA ADMINISTRATOR ASAPH H. HALL DISCUSSES IMPLEMENTATION OF RAIL LEGISLATION**

The Federal Railroad Administrator discusses the implementation and implications of the Railroad Revitalization and Regulatory Reform Act of 1976. The discussion touches on railroad rehabilitation, the upgrading of the Northeast rail passenger Corridor, ConRail and the legislation's impact on the U.S. railroad industry.

Carroll, J (Association of American Railroads) *Transportation USA* Vol. 2 No. 4, 1976, pp 4-9

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

DOTL JC

25 141574

**STATES' ROLE IN PLANNING FOR ABANDONED RAIL RIGHTS-OF-WAY**

The Rail Reorganization Act of 1973 has given states in the Northeast region a responsibility for lines designated as surplus. It is suggested that all states consider new agencies which may be needed and legislation which may be necessary for the use of rail rights-of-way following abandonment. Analysis of alternatives should permit a comparison between rail and non-rail uses of each right-of-way so it will be developed for the best use. Any agency with overall jurisdiction for managing rail service should be able to delegate to other agencies jurisdiction over non-rail use of such property, maintaining responsibility for monitoring the delegated agency's activities.

First presented at the Transportation Session, American Institute of Planning Meetings, October, 1975; research funded by the U.S. Railway Association.

Nehman, GI Miller, JD (Battelle Columbus Laboratories) *High Speed Ground Transportation Journal* Vol. 10 No. 4, 1976, pp 99-107, 1 Fig., 15 Ref.

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25 141580

**AN OPPORTUNITY FOR CHANGE**

This response by the British Railways Board to the government's Transport Policy Consultation Document (RRIS 138339) stresses the Document's concentration upon short-term measures to cope with immediate economic conditions; its inadequate information base; and its choice of advisers with disregard of professional transport operators. The result, according to BRB, is distortions of several key issues. Among the BRB points: Changes in the transport network are long lead-time projects requiring high investment; planning requires long-term forecasts of transport demand; instead of defining a perfect policy several viable options with the maximum rate of change that is physically and financially practicable should be developed. The Consultation Document glosses over possible changes in terms of competition and productivity. BRB details passenger and freight service recommendations, ways to increase productivity and planned investment.

A review of this paper is published in *Modern Railways* (Shepperton, U.K.), Vol. 23, No. 336 (Sept., 1975), pp. 337-340, and can be seen at the Department of Transportation Library.

British Railways Board July 1976, 87 pp, 1 Tab.

ORDER FROM: British Railways Board 222 Marylebone Road, London NW1 6JW, England

25 141652

**PROCUREMENT OF RAIL PASSENGER CARS FOR THE NEW HAVEN URBAN MASS TRANSPORTATION ADMINISTRATION, DOT: REPORT OF THE COMPTROLLER GENERAL OF THE UNITED STATES**

No Abstract.

Available free to members of Congress, Congressional Committee Staff, government officials, college libraries, faculty and students, non-profit organizations.

General Accounting Office, (B-107449) GA 1.13:RED-76-15, 1975, 37 pp

ACKNOWLEDGMENT: General Accounting Office

ORDER FROM: General Accounting Office 441 G Street, NW, Washington, D.C., 20548

25 141653

**IMPROVEMENTS NEEDED IN PROCUREMENT AND FINANCIAL DISCLOSURE ACTIVITIES OF THE U.S. RAILWAY ASSOCIATION: REPORT TO THE SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS, HOUSE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE**

No Abstract.

Available free to members of Congress, Congressional committee staff, government officials, college libraries, faculty and students, non-profit organizations.

General Accounting Office, (B-183495) GA 1.13:RED-76-41, 1975, 47 pp

ACKNOWLEDGMENT: General Accounting Office

ORDER FROM: General Accounting Office 441 G Street, NW, Washington, D.C., 20548

25 141654

**SELECTED VIEWS AND ISSUES RELATED TO REGULATORY REFORM IN THE TRANSPORTATION INDUSTRY**

No Abstract.

A staff paper prepared for the Subcommittee on Oversight and Investigation of the Committee on Interstate and Foreign Commerce, U.S. House of Representatives. Available free to members of Congress, Congressional committee staff, government officials, college libraries, faculty and students, non-profit organizations.

General Accounting Office, (OPA-76-13) GA 1.13:OPA-76-13, 1976, 82 pp

ACKNOWLEDGMENT: General Accounting Office

ORDER FROM: General Accounting Office 441 G Street, NW, Washington, D.C., 20548

25 141685

**METROPOLITAN TRANSPORTATION IN TOKYO**

After three decades of rapid population growth, Tokyo's metropolitan area seems to be stabilizing. However the opportunity to implement positive policies to solve housing and transportation problems has been lost and travel congestion is a fact of life. The decline in population and decrease in employment are in part a result of inadequate regional planning. The article describes modal split, the role of rapid transit and commuter trains, and the role and control of motor transportation are discussed. One area studied is dispersion of population beyond the present metropolitan area, utilizing ultra-high-speed trains for commuter services.

Kakumoto, R (Japan Transport Economics Research Center, Tokyo) *Union Internationale des Transports Publics, Revue* Vol. 25 No. 2, 1976, pp 84-93, 13 Tab.

ORDER FROM: International Union of Public Transport Avenue de l'Uruguay 19, B-1050 Brussels, Belgium

25 142244

**SURFACE TRANSPORT: MIDDLE-OF-THE-ROAD SOLUTION**

If either steadfast adherence to traditional regulation or complete price freedom predominates, the current uneconomic transportation situation will lead to a price war between private and common carriers. One way to assure competitive prices, says this author, is for the Interstate Commerce Commission to permit privately negotiated but publicly regulated contracts. In this article, the author reviews the case of the "deregulators" as well as that of the "status quo'ers," and offers an equitable means of bringing unregulated traffic into common carriage. He further shows how regulated contracts might work in practice if applied to the meat industry, an area of paramount concern to the American consumer and probably the most acrimonious battleground between rail common carriers and shippers in recent history.

Stern, GL (Illinois Central Gulf Railroad) *Harvard Business Review* Vol. 54 Nov. 1975, pp 80-89

ACKNOWLEDGMENT: Harvard Business Review

ORDER FROM: Harvard Graduate School of Business Administration  
214-16 Baker Library, Soldier Field, Boston, Massachusetts, 02163  
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25 142293

**THE SIMULATION MODEL FOR TRANSPORT POLICIES [Le modele de simulation de politiques des transports]**

This simulation model for studying the main interaction between the different modes of transport takes account of: the distribution of passenger and freight traffic according to groups of destinations; developments in traffic flows; service quality characteristics (regularity, packing, speed, etc.); the type of markets depending on the size of the consignments; and the role of the public authorities. The first version of a model for passenger traffic has been prepared for the SNCF. [French]

Bevlioz, C *Statistiques et Etudes Financieres* No. 23, June 1976, pp 4-19, 2 App.

ACKNOWLEDGMENT: UIC

ORDER FROM: French National Railways 88 rue Saint-Lazare, Paris 9e, France

25 142296

**CURRENT TRANSPORT OPERATING KNOWLEDGE QUESTIONS [Gegenwartsfragen der Verkehrsbetriebslehre]**

So that decisions on transport investment can be made, calculations on the economic viability of the undertaking should be supplemented by similar calculations for the national economy. The authors explain, among other things, the calculation of costs on the railways, the problems of sales and services and the influence on the development of the transport offered. [German]

Willeke, R  
Deutsche Verkehrswissenschaftliche Gesellschaft 1975, 326 pp, Figs., Tabs., Refs.

ACKNOWLEDGMENT: UIC

ORDER FROM: Deutsche Verkehrswissenschaftliche Gesellschaft Caecilienstrasse 20/24, 5 Cologne, West Germany

25 142314

**STAGING LONG-RANGE TRANSIT PLANS**

The article examines the staging strategies that are based on a rationale that is applicable to the individual metropolitan area and involves complex, interwoven considerations of demonstrated transit usage, highway congestion, financial resources, institutional climates, technical justification, and the area's commitment to the goals and objectives of public transportation services.

Evoy, HD (Parsons, Brinckerhoff, Quade and Douglas, Inc) *Traffic Quarterly* Vol. 30 No. 3, July 1976, pp 413-429

ACKNOWLEDGMENT: EI

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25 142482

**TRANSPORT RESEARCH AND ITS ROLE**

It is now widely recognized that technical and scientific advice and information is required to help in the formulation and development of transport policies and in their effective implementation. This is true for particular transport modes-road, rail, air and sea-and also for broader questions of transport planning and information. In almost all transport problems, social and environmental aspects are growing in importance; narrow technical solutions and even a broader techno-economic approach are seldom adequate. This reflects changing public attitudes and priorities, and today the information required to aid central and local government transport policies should include consideration of many critical social factors which are difficult to gauge in generally acceptable objective terms. An attempt to do so is an essential element in transport research and increasingly influences the activities of those engaged in such work. The paper outlines ways in which transport research laboratories and similar organizations are tackling this task, and illustrates them by examples drawn from work on infrastructure and vehicles, traffic and safety, and systems and operations. It also includes some comments on the organization of transport research. /Author/ /TRRL/

Silverleaf, A  
Transport and Road Research Laboratory Supplement TRRL-SR-215UC, 1976, 8 pp, 4 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 221991)

ORDER FROM: Transport and Road Research Laboratory Department of the Environment, Crowthorne RG11 6AU, Berkshire, England

25 142510

**STATE RESPONSIBILITIES FOR RAIL PRESERVATION**

In the wake of bankruptcies, a new federal government attitude toward the railroad industry treats the railroads as businesses, incapable of survival without profits in a free market, rather than public utilities charged with responsibility for effecting social goals. Responsibility for effecting social goals is being shifted to those benefiting from rail services--states, local communities and shippers. This article reviews the financial health of major U.S. railroads and explains the nature of new state and local responsibilities for rail planning. States now bear responsibilities for rail preservation, for continued railroad planning programs and for development of a data base upon which continuing transportation research may be conducted.

Johnson, MA (Oklahoma State University) *State Government* Vol. 49 No. 3, June 1976, pp 148-154, 3 Tab.

ORDER FROM: Council of State Governments P.O. Box 11910, Lexington, Kentucky, 40511

25 142518

**HOW MUCH FEDERAL SUBSIDY WILL AMTRAK NEED?**

No Abstract.

General Accounting Office, (B-175155) Cong. Rpt. RED-76-97, 1976, 74 pp

ACKNOWLEDGMENT: Government Printing Office

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GA 1.13:RED-76-97

25 142519

**A REVIEW OF ALTERNATIVE APPROACHES TO FEDERAL FUNDING OF RAIL REHABILITATION**

No Abstract.

Prepared at the request of the U.S. Congress, Office of Technology Assessment, Senate Committee on Commerce, Surface Transportation Subcommittee, by Harbridge House, Inc.

United States Congress Cong. Rpt. Item 1070-M, 1975

Contract OTA-C-25

ACKNOWLEDGMENT: Government Printing Office

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**RAILWAY LABORATORY FOSTERS COLLABORATION BETWEEN GOVERNMENT AND INDUSTRY**

The National Research Council Railway Laboratory has the equipment and expertise to determine the characteristics of a variety of railway hardware. It also carries out design and development examinations, using modern engineering techniques to assist in advancing the state of the railway art.

Connock, SHG Smith, CAM Blader, FB *Engineering Journal (Canada)* Vol. 59 No. 2, Mar. 1976, pp 31-32

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25 142923

**REGULATION, COMPETITION, AND THE PUBLIC INTEREST**

This book explores many facets in the relationship between transportation as a regulated industry and the public interest. The discussion includes the rationale for regulation of transportation, an analysis of the consumer interest in regulated industries, and the costs of air transport regulation in

the face of inflation. Many of the papers are based on Canadian experience but U.S. and British regulatory situations are also discussed.

British Columbia University, Canada Book 1976

ORDER FROM: Centre for Transportation Studies British Columbia University, Vancouver V6T 1W5, British Columbia, Canada

25 142930

**COMPETITION IN THE TRANSPORTATION INDUSTRY**

There are proposals currently under consideration to "deregulate" the transportation industry. This paper examines the basic economic structure of several modes of transportation in an attempt to forecast how successful competition is likely to be as a regulator of price and service to the public. The conclusions are that where the market is close to the economists classical "free market" as in trucking, competition is likely to be reliable, but where oligarchy or monopoly will exist, as in rail transport, competition will be unreliable. The common carrier concept has served this country well in the past and should not be discarded without careful study of the consequences.

Clark, DM Schwarzwalder, JJ *ASCE Journal of Transportation Engineering* Proceeding Vol. 102 No. TE3, Paper 12290, Aug. 1976, pp 489-505

ACKNOWLEDGMENT: ASCE

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25 142940

**BENEFITS AND COSTS OF URBAN TRANSPORTATION: HE WHO IS INELASTIC RECEIVETH AND OTHER PARABLES**

The determinations of incidence of benefits and costs of an urban transportation improvement and its financing are discussed. Important to policy makers are two main issues: How does one determine who benefits and who pays for transportation improvements, and how can information on the benefits and costs be used to formulate better urban transportation plans? Economists do what in welfare economics is assessment of overall benefits and costs. Policy makers are also interested in who receives these benefits and who bears the costs. Economists need to refine their methods to assure more rational public policies.

Seventeenth Annual Meeting of the Transportation Research Forum, Beyond the Bicentennial: The Transportation Challenge, held in Boston, Massachusetts, October 28-30, 1976.

Boyd, JH (Motor Vehicle Manufacturers Association)

Cross (Richard B) Company Proceeding 1976, pp 291-97, 3 Fig., 9 Ref.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

25 142942

**COMPETITIVE FORCES AFFECTING CANADIAN RAIL RATES THROUGH SHIPPER-CARRIER NEGOTIATIONS**

This paper describes effects of competitive forces affecting rail service in Canada since the National Transportation Act of 1967, based primarily on interviews with shippers and carriers involving 72 rate negotiations. Some light is shed on the actual workings of the market process rather than on theoretical analysis of rates and traffic flows. Main features of railway rate regulation and rate making in Canada are described, along with the bases on which shippers negotiate rates and suggestions for possible changes in Canadian rate making procedures and regulatory legislation.

Seventeenth Annual Meeting of the Transportation Research Forum, Beyond the Bicentennial: The Transportation Challenge, held in Boston, Massachusetts, October 28-30, 1976.

Heaver, TD (British Columbia University, Canada)

Cross (Richard B) Company Proceeding 1976, pp 388-97, 1 Tab.

ORDER FROM: Vietsch (Grant C) P.O. Box 405, Oxford, Indiana, 47971

25 142949

**TRANSPORTATION SUBSIDIES--NATURE AND EXTENT**

This is a comprehensive treatment on North American experience with subsidies and indicates how well-intentioned programs have sometimes failed to achieve their stated purposes. Information is given on government expenditures in the U.S. and Canada for rivers and harbors, inland waterways, airways and airports, freeways and highways, navigation facilities, direct grants and subsidies. The chapters: Subsidy Mechanisms, the

U.S. Experience; Transport Subsidies in Canada; subsidy and Counter Subsidy; Grain Movement Subsidies and Economic Distortions; Indirect Subsidies in Canadian Aviation; The Effect of Transportation Subsidies in Developing Countries; Subsidies and Local Service Airlines--the U.S. Experience; Feed Grain Subsidies.

British Columbia University, Canada No Date

ORDER FROM: British Columbia University, Canada Center for Transportation Studies, Vancouver V6T 1W5, British Columbia, Canada

25 143324

**WORKING PAPER ON RAIL REORGANIZATION ECONOMIC DEVELOPMENT ISSUES**

The Regional Rail Reorganization Act of 1973 (Public Law 90-236) was enacted on January 2, 1974, and concentrated on restructuring the rail systems held by the bankrupt carriers in states comprising the Northeast and Midwest portions of the United States. The Final System Plan provided for the creation of ConRail. The dimensions of change to be brought about as a result of possible implementation of the Final System Plan could have significant impacts on economic development. The question posed for the Economic Development Administration (EDA) is whether or not its investment strategies to stimulate economic development should be modified. The analysis proceeds to (1) identify the most critical economic development issues raised by rail service changes, and (2) determine the impact of rail service changes on EDA programs. Based on this analysis, the study suggests possible EDA responses.

RMG Associates Incorporated, Economic Development Administration EDA-OPR-761-17, Aug. 1975, 37 pp

Grant EDA-PF-488

ACKNOWLEDGMENT: NTIS

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PB-256685/9ST, DOTL NTIS

25 144070

**RAILROAD REORGANIZATION: CONGRESSIONAL ACTION AND FEDERAL EXPENDITURES RELATED TO THE FINAL SYSTEM PLAN OF THE US RAILWAY ASSOCIATION**

No Abstract.

General Accounting Office 1976, 51 pp

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

S/N 052-070-03159-0

25 144073

**THE MARKET DOMINANCE TEST: THE 1976 ACT'S NEW APPROACH TO RAILROAD RATE REGULATION**

With passage of the Railroad Revitalization and Regulatory Reform Act of 1976, the U.S. has embarked on an experiment in reduced railroad regulation. If utilized creatively and responsibly, the greater freedom now accorded railroads in their rate setting can work to their advantage and ultimately can benefit users. Whether the opportunity will be fully exploited depends largely on the ability of railroads, shippers and the Interstate Commerce Commission to adapt to new ways and to permit this experiment in transport policy to be fairly tested.

Barber, RJ *Transportation Journal* Vol. 15 No. 4, June 1976, pp 5-14

ORDER FROM: American Society of Traffic and Transportation 547 West Jackson Boulevard, Chicago, Illinois, 60606

DOTL JC

25 144084

**INFORMATION ON LOAN GUARANTEE PROGRAMS UNDER THE RAIL PASSENGER SERVICE ACT AND THE REGIONAL RAIL REORGANIZATION ACT**

This is a report on DOT loan guarantee programs administered under the Rail Passenger Service Act of 1970 and the Regional Rail Reorganization Act of 1973. Amtrak had guaranteed obligations, loans and "leveraged" leases, estimated to be about \$425 million by the end of fiscal 1975. Amtrak could not be expected to retire its guaranteed debt in the near future and proposed capital improvements total about \$2 billion over a 5-year period.

Annual operating deficits were projected to increase through 1979. The mechanisms of leveraged leases for financing of new rolling stock and the implications of this procedure on federal financing are discussed. As of the date of the report, no loans had yet been made under the Regional Rail Reorganization Act.

Comptroller General of the United States RED-75-329, No Date, 79 pp, 4 App.

ACKNOWLEDGMENT: Comptroller General of the United States  
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**25 144104**  
**TRANSPORT-ACCOUNTABILITY AND CONSUMER CHOICE**

To a large extent transport in the United Kingdom, especially transport of passengers, is seen as a public service. Market forces are not allowed to have much sway; and the result is that in many cases the benefits received by society do not match the costs. The fact that British rail is running at a vast loss is obviously important, but much more important is the fact that British rail is using society's resources in ways which are extravagant and wasteful. The contention of this article is that such waste will persist unless operations are made subject to market forces, and that these forces can best be brought to bear by competition. It does not necessarily follow that all sections of the industry should return to private enterprise, although such an idea has much to support it. It does mean, however, that many of the units should be smaller than they are at present.(a)

Hibbs, J *National Westminster Bank Quarterly Review* Feb. 1976, pp 58-68

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD 221787X)  
ORDER FROM: National Westminster Bank Limited 41 Lothbury, London, England

**25 145134**  
**THE WISCONSIN STATE RAIL PLAN**

This plan is to satisfy requirements of Federal and state legislation and is to make the state eligible for federal rail assistance. Subject to continual modification, the plan is to guide allocation of funds for maintenance and for improvement of rail service. There are 10 Chapters: Introduction; Purposes of the Wisconsin Rail Plan; Wisconsin Rail System; Goals and Policies for Wisconsin Rail Transportation; Rail Passenger Services; Rail Freight Services; Lake Michigan Ferries; Eliminating Urban Rail Conflicts in Wisconsin; Branch Line and Lake Michigan Car Ferry Analysis Methodology; Results of the Branch Line and Lake Michigan Car Ferry Ranking Analysis; Guidelines for Continued Rail Planning. In appendices the data and techniques used in rail planning are detailed.

This plan was funded in part by the FRA and the Upper Great Lakes Regional Commission.

Wisconsin Department of Transportation Aug. 1976, 245 pp, Figs., Refs., 9 App.

ACKNOWLEDGMENT: Wisconsin Department of Transportation  
ORDER FROM: Wisconsin Department of Transportation Madison, Wisconsin, 53702

**25 145158**  
**CHARTING THE LIMITS OF WHEEL-ON-RAIL**

By 1982 the West German Government hopes to amass data upon which to base a strategic decision about the future of high-speed guided transport (HSB). In parallel with maglev research, a lengthy investigation into the physical limits of conventional wheel-on-rail systems was initiated in 1972 to provide comparable data. The most sophisticated roller rig ever built is now being installed in Munich, and work on a test circuit at Donauried should be next year.

*Railway Gazette International* Vol. 132 No. 8, Aug. 1976, pp 301-302, 2 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: ESL

DOTL JC

**25 145166**  
**RAILROAD CONSOLIDATION AND RELOCATION IN URBAN AREAS: REPORT OF THE SECRETARY OF TRANSPORTATION TO THE CONGRESS OF THE UNITED STATES**  
No Abstract.

Department of Transportation, (94-2:S.doc.207) Cong. Rpt. Senate doc. 94-207, 1976, 102 pp, Figs.

ACKNOWLEDGMENT: Government Research Abstracts  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO Item 996

**25 145167**  
**TRANSPORTATION ISSUES IN THE FEDERAL BUDGET FOR FISCAL YEAR 1977**

No Abstract.

This document reports a hearing before the House Budget Committee's Task Force on Community Resources and General Government, March 9, 1976.

United States House of Representatives, (Y4.B85/3:T68/977) 1976, 43 pp

ACKNOWLEDGMENT: Government Research Abstracts  
ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO Item 1035-B

**25 145328**  
**PUBLIC POLICY DEVELOPMENT: THE MATRIX FOR DECISION MAKING**

This paper is concerned with policy analysis and largely with the social acceptability dimension. It focuses on a specific policy issue: energy conservation in urban transportation. The purpose is to examine the implications of the more subjective considerations in policy development and to suggest a means for including these dimensions in the larger policy development process. The process described, furthermore, represents an attempt to provide evaluative information to public decision makers in a form and content responsive to their needs. The process is based on two assumptions. One is that data and their analysis should be open rather than closed. The second assumption is that public policy making has an essential linking function between the society and its decision making. Because of matters of social concern attitudes and values determine the acceptability of policy alternatives, some measures of these attitudes and values are essential criteria for the policy making process.

Michaels, RM (Illinois University, Chicago Circle) *Transportation Research Record* No. 592, 1976, pp 35-37, 1 Fig., 1 Tab., 2 Ref.

**25 145531**  
**URBAN TRANSPORTATION DECISION MAKING. SUMMARY**  
[Final rept.]

The report is one in a series encompassing ten monographs and a summary. Together they describe the transportation decision process in a number of major cities in the U.S., Canada and Western Europe, and interpret this information in such a way as to derive observations and conclusions useful in the identification of progressive transportation decision-making institutions. The monographs contain largely descriptive information and cover the following cities: United States: Atlanta, Minneapolis/St. Paul, Miami/Dade County, Seattle; Canada: Toronto, Montreal; Europe: Hamburg, Manchester and Leeds, Stockholm and Gothenburg, Amsterdam. Interpretive and analytical information is confined largely to the Summary and Conclusion volume.

See also PB-257996.

Colcord, FC  
Tufts University, Office of Policy, Plans and International Affairs Final Rpt. OST-TPI-76-02-01, Sept. 1974, 187 pp

Contract DOT-OS-30036

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257995/1ST, DOTL NTIS

25 145532

**URBAN TRANSPORTATION DECISION MAKING: 4. MIAMI-DADE COUNTY: A CASE STUDY**

The report is one in a series encompassing ten monographs and a summary. Together they describe the transportation decision process in a number of major cities in the U.S., Canada and Western Europe, and interpret this information in such a way as to derive observations and conclusions useful in the identification of progressive transportation decision-making institutions. This monograph contains a transportation study of Miami, Florida.

See also PB-257997

Colcord, FC Polan, SM  
Tufts University, Office of Policy, Plans and International Affairs Final Rpt. OST-TPI-76-02-02, July 1973, 80 pp

Contract DOT-OS-30036

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257996/9ST, DOTL NTIS

25 145533

**URBAN TRANSPORTATION DECISION MAKING: 5. ATLANTA. A CASE STUDY**

The report is one in a series encompassing ten monographs and a summary. Together they describe the transportation decision process in a number of major cities in the U.S., Canada and Western Europe, and interpret this information in such a way as to derive observations and conclusions useful in the identification of progressive transportation decision-making institutions. This monograph contains a transportation study of Atlanta, Georgia.

See also PB-257998.

Colcord, FC Polan, SM  
Tufts University, Office of Policy, Plans and International Affairs Final Rpt. OST-TPI-76-02-03, July 1973, 84 pp

Contract DOT-OS-30036

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257997.7ST, DOTL NTIS

25 145534

**URBAN TRANSPORTATION DECISION MAKING: 6. MINNEAPOLIS, ST. PAUL. A CASE STUDY**

The report is one in a series encompassing ten monographs and a summary. Together they describe the transportation decision process in a number of major cities in the U.S., Canada and Western Europe, and interpret this information in such a way as to derive observations and conclusions useful in the identification of progressive transportation decision-making institutions. This monograph contains a transportation study of the twin cities, Minneapolis-St. Paul.

See also PB-257999.

Colcord, FC Polan, SM  
Tufts University, Office of Policy, Plans and International Affairs Final Rpt. OST-TPI-76-02-04, July 1973, 58 p

Contract DOT-OS-30036

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257998/5ST, DOTL NTIS

25 145552

**URBAN RAIL SUPPORTING TECHNOLOGY. A FIVE YEAR PROGRESS SUMMARY, 1971-1976**

Contents: Program management; Applications engineering and technical support; Facilities development; Test and evaluation; Technology development; Noise abatement; Tunneling; Safety and reliability.

(PC A07/MF A01)

Transportation Systems Center, Urban Mass Transportation Administration UMTA-MA-06-0025-76-7, June 1976, 133 pp

Contract DOT-MA-06-0025

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-25909/9ST, DOTL NTIS

25 147583

**THE THREAT IS REAL: WHERE DO WE GO WITH COMMON CARRIAGE?**

Faces of the unregulated vs common carrier transportation controversy are examined. The problems for railroads resulting from private carriage, agricultural exemption, inland waterway and slurry pipeline competition are described.

Roberts, R *Modern Railroads/Rail Transit* Vol. 31 No. 9, Sept. 1976, pp 78-81, 5 Fig., 2 Phot.

ORDER FROM: Passenger Train Journal 15 PTJ Publishing Incorporated, P.O. Box 1025

DOTL JC

25 147640

**ROAD AND RAIL: NOT EITHER, BUT BOTH**

In putting forward his views on the question of roads versus railways the author says that the debate should be ended and the best made of what exists at present. It is suggested that the main trouble is a lack of co-ordination between the two and that a more positive approach to integrated transport policy as seen in other countries is needed. Improvements to the existing system rather than new schemes would have a less drastic effect on the community. The problem is not financial but managerial and is particularly notable in rural areas. /TRRL/

Ginsburg, L *Architects Journal* Vol. 163 No. 26, June 1976, pp 1287-8, 2 Phot.

ACKNOWLEDGMENT: 5 (TRRL56038E)

ORDER FROM: Architects Press Limited 9 Queen Annes Gate, London SW1, England

25 147680

**NATIONAL TRANSPORTATION TRENDS AND CHOICES TO THE YEAR 2000**

A projection of the form and direction that the U.S. transportation system will take over the next 25 years has been made as a foundation for the development of a national transportation policy, but the report is not itself written as a plan of action. Detailed are the choices faced by Americans in dealing with their dominant taxpayer-financed highway system. Transport modes are working at cross purposes, in terms of a healthy economy and of survival of the cities. Airlines and railroads face money shortages needed to maintain existing facilities and to expand. No decline is seen in demands for transport services for the remainder of the century and this will impose additional costs on society. Petroleum products account for more than 95 per cent of energy used to operate transportation and transportation accounts for more than half the annual petroleum consumption. Planning efforts may have to be redirected because of petroleum shortages, even with development of more costly substitute liquid fuels. Among the questions raised: How should a democratic society allocate current resources between today's needs and long-term problems? When should the public intervene in free-enterprise marketplace decisions? How can government best institute orderly procedures to make necessary changes in public policy, given the near-term impact on persons and institutions?

A special supplement of Transportation Systems Maps accompanying the report is also available.

Coleman, WT, Jr  
Office of the Secretary of Transportation Jan. 1977, 412 pp

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

DOTL

25 147820

**THE RAILWAY IN EUROPEAN TRANSPORT PLANNING**

A brief outline of the present situation of the railway on the transport market is followed by a discussion of the effects of the EC's transport policy on the railways and their activities, particularly with respect to the infrastructure. Mention is made of the European Infrastructure Target Plan in connection with the railway's improvement and adaptation. The projects of the individual railway administrations are roughly outlined, highlighting their



compliance with the guide lines of the target plan. In a review of the aspects of railway traction, the importance of electric traction is emphasized, with precedence being given to the train with motive power units at higher speeds and a further reduction of the multitude of different vehicle types being considered desirable. Procurements will decline in the course of the next few years, since the structural changes have already reached an advanced stage, while a reserve of tractive stock has accumulated due to the decline in traffic volume. Nevertheless, the prospects for the future are characterised by a damped optimism. [German]

Lehmann, H *Glaser's Annalen ZEV* Vol. 100 No. 7/8, July 1976, pp 219-224

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

#### 25 147857

##### SOME POLICY IMPLICATIONS OF SUBJECTIVE FACTORS IN THE MODAL CHOICE FOR FREIGHT MOVEMENTS

The Australian constitution gives the Australian government control for overseas transport, for transportation, from and within the territories and for interstate transport. Regulation of transportation within the state boundaries is the responsibility of the individual states. This control has, so far, only been exercised for sea and air movements, but recently, the government has commenced to extend its right to regulate in-state freight movements to road and rail. Freight traffic between Melbourne and Sydney is of particular interest in the development of the national highway system, and is described as being 63.8 per cent by road, 22.7 per cent by rail, 13.2 per cent by sea and 0.3 per cent by air. This article describes a study which analyses the processes a sample of distribution managers and transportation managers perform when making the modal choice for freight movements between the two cities. The aim of the study was to establish the factors which were important in the modal choice for this traffic so that, with the help of this information, policy could be established for the development of the road link between Melbourne and Sydney. /TRRL/

Gilmour, P (Monash University, Australia) *Logistics and Transportation Review* Vol. 12 No. 1, 1976, pp 39-57, 1 Fig., 7 Tab., 24 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-223271)

ORDER FROM: British Columbia University Faculty of Commerce, Vancouver 8, British Columbia, Canada

#### 25 147862

##### THE 'NEW' TRANSPORTATION POLICY AND THE PUBLIC INTEREST

In June 1975, the Minister of Transport released a set of proposals for revisions of Canada's transport policy. The author explains that although as this is written, the proposed revisions have not been embodied in new legislation, their appearance marks the end of a year's re-thinking of the federal government's role in Canadian transportation and, more importantly, an ostensible shift from the policy principles adopted so confidently in the 1967 National Transportation Act. The purpose of this paper is to review the Minister's transport policy proposals and to assess their impact on the public interest. Canada's transportation system is described as being 55 percent passenger transport and 45 percent freight. The split between intercity and urban is about 50-50, with intercity transport having a slight edge. An estimated two-thirds of the expenditures are made for private transportation and only one-third for commercial transportation. The role of the federal government in monitoring the operation and evolution of the system is described, a definition of the term "public interest" follows, and the policy proposals are then summarized and evaluated. /TRRL/

Munro, JM (Simon Fraser University, Canada) *Logistics and Transportation Review* Vol. 12 No. 1, 1976, pp 3-23, 2 Tab., 38 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-223045)

ORDER FROM: British Columbia University, Canada Faculty of Commerce, Vancouver 8, British Columbia, Canada

#### 25 147863

##### NATIONAL STUDIES OF URBAN ARTERIAL TRANSPORTATION. A RESEARCH FRAMEWORK

A research framework is presented for the estimation of the national markets and social, economic and environmental impacts of new systems of urban arterial transportation, such as automated guideway and rail and bus rapid transit systems. A statistical step-wise procedure, based upon the extrapolation of results from a limited number of analytical case studies to the set of all candidate metropolitan areas, is specified. Results are provided for the application of all steps in the procedure preceding the conducting of actual case studies: 80 candidate metropolitan areas are classified into nine relatively homogeneous groups with respect to their arterial transportation needs; the most representative areas within each group are identified as preferred case study locales; and guidelines are developed for the extrapolation of system costs, benefits and market estimates from the case studies to the remaining areas within the groups through sensitivity analyses. In addition, intermediate multivariate statistical results are interpreted as inputs to the development of hypotheses describing relationships between transportation and urban structure. /Author/TRRL/

Golob, TF Cauty, ET Gustafson, RL  
General Motors Research Laboratories Res. Rpt. GMR-1274, Jan. 1973, 43 pp, 1 Fig., 9 Tab., Refs.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-223238)

ORDER FROM: General Motors Research Laboratories Twelve Mile and Mound Roads, Warren, Michigan, 48090

#### 25 147864

##### PERSPECTIVES FOR NEW TRANSPORT POLICIES

This paper illustrates that while transportation has its costs and benefits, many of these costs and benefits are often unpredictable and unexpected and in the future they should be more clearly related to one another. This paper also touches briefly on transportation policy as reflected in current legislation and on the concerns that led to the new transportation policy. /TRRL/

Brennan, M Mulder, N  
Transport Canada Oct. 1975, 22 pp

ACKNOWLEDGMENT: Roads and Transportation Association of Canada (RTAC02154E), Transport and Road Research Laboratory (IRRD-222702)

ORDER FROM: Transport Canada Tower C, Place de Ville, Ottawa, Ontario K1A 0N5, Canada

#### 25 147865

##### PUBLIC VERSUS PRIVATE TRANSPORT

This book compares the economic and environmental characteristics of public and private transport modes, and reviews the potential for modifying modal split in each of the main sectors of the transport market. Opening with a review of the traditional "track-cost" argument on the relative merits of public and private transport, the author concludes that it is the comparison of costs and benefits of future infrastructure changes rather than historic revenue and cost comparisons that is relevant to the issue of choice of modal split. A consideration of the relative pollution and resource depletion caused by different modes furthers the conclusion that normal commercial criteria do not provide a good way of allocating resources in the transport sector. Alternative methods of modifying modal split are then considered. A chapter is devoted to each of the main sub-divisions of the transport market. On urban passenger transport it is concluded that a strategy based on major use of public transport rather than large-scale road building is feasible and has many advantages. In the inter-urban and rural passenger market, whilst there is evidence of resource misallocation the problem of how to deal with it is harder to resolve. Although much freight traffic is captive to road transport given patterns of institutions and land use- there is likely to be scope here too for beneficial changes not only in modal split but also more generally in methods of freight handling. The final conclusion is that it is only by looking at specific locations and specific traffics that the question of optimal division between public and private transport can be resolved. /TRRL/

Published in the Studies in Economics Series.

Nash, C (Leeds University, England)  
Macmillan Press, Limited 1976, 96 pp, 9 Fig., 2 Tab., 130 Ref.

ACKNOWLEDGMENT: Transport and Road Research Laboratory (IRRD-222230)

ORDER FROM: Macmillan Press, Limited 4 Little Essex Street, London WC2R 3LF, England

25 147868

**ADMINISTRATION OF TRANSPORT POLICY: EMERGING PROBLEMS AND PATTERNS**

This report was designed to focus attention on emerging problems and patterns in the administration of transportation policy in Canada. The papers contained in this report were given at the Sixth National Seminar on the Administration of Transport Policy. The papers cover such topics as Canadian transportation infrastructure; Transportation policy and jurisdictional issues; Transport in Canada: Needs, trends, and problems; and What belongs in transportation policy. /TRRL/

Langford, JW (York University, Canada)

Institute of Public Administration, Canada Vol. 18 No. 4, 1975, pp 571-668, Figs., Tabs.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada (RTAC02189E), Transport and Road Research Laboratory (IRRD-222735)

ORDER FROM: Institute of Public Administration, Canada 897 Bay Street, Toronto, Ontario, Canada

25 147871

**NEW TRANSPORTATION POLICY AND INITIATIVES JUNE 1975**

This report sets out the government's views on transportation policy and indicates the future course of government action as well as announcing a number of specific measures to begin to give effect to the policy. /TRRL/

Transport Canada June 1975, 20 pp

ACKNOWLEDGMENT: Roads and Transportation Association of Canada (RTAC02136E), Transport and Road Research Laboratory (IRRD-222684)

ORDER FROM: Transport Canada Transport Canada Building, Place de Ville, Ottawa, Ontario K1A 0N5, Canada

25 147892

**A COST AND BENEFIT EVALUATION OF SURFACE TRANSPORT REGULATION**

This staff report represents a working tool in the ICC's continuing analysis of the role of regulation of the surface transportation industry. It focuses heavily on criticism of regulation and estimates of its costs. Specific tests of the assumptions, formulas and other factors were conducted leading to the conclusion that it would cost the economy \$4.8 billion if the ICC were eliminated. It is attempt to quantify benefits, the Bureau of Economics put values on car utilization, carrier financing, inventory reductions and impacts of loss and damage. Unquantifiable were such results of regulation as rate and service stability, market competition, balanced car supply, and others. The report is not a definitive critique, but rather a working paper to generate interest and research inside and outside the government.

Interstate Commerce Commission Statement No. 76-1, No Date, 30 pp, 7 Tab.

ORDER FROM: Interstate Commerce Commission 1112 ICC Building, Washington, D.C., 20423

25 147896

**STATE RAIL ACTIVITIES**

In many states outside the Northeast, the only state involvement with railroads had been in the grade crossing area. This all changed with passage of the Railroad Revitalization and Regulatory Reform Act of 1976, in which Title VIII requires development of a state rail plan. The Regional Rail Reorganization Act of 1973 required a similar plan from northeastern and certain midwestern states in which affected bankrupt linesoperated. Rail planning activities of Connecticut, Michigan, New Jersey and New York under the 3R Act and of North Carolina, Tennessee and Virginia under the 4R Act are reported.

AASHTO Quarterly Vol. 55 No. 4, Oct. 1976, p 7, 5 Phot.

ORDER FROM: American Assn of State Hwy and Transp Officials 341 National Press Building, Washington, D.C., 20004

25 147902

**INDIANA STATE RAIL PLAN: A METHODOLOGY REVIEW**

No abstract.

Publication of Rail Planning and Policy Series.

Figozzi, BW

Indiana University, Bloomington No. 2, 1976, 64 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147903

**RAIL ATLAS OF INDIANA**

No abstract.

Publication of Rail Planning and Policy Series.

Martin, RN

Indiana University, Bloomington No. 3, 1976, 111 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147904

**LEGISLATIVE DEVELOPMENT OF THE RAIL SERVICE CONTINUATION PROGRAM**

No abstract.

Publication of Rail Planning and Policy Series.

Black, WR

Indiana University, Bloomington No. 4, 1976, 27 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147905

**RAIL SERVICE CONTINUATION SUBSIDIES: A MODEL TO ASSIST STATE GOVERNMENTS**

No abstract.

Publication of Rail Planning and Policy Series.

Schuler, HJ Proserpi, DC

Indiana University, Bloomington No. 5, 1976, 23 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147906

**USRA SEGMENTS IN INDIANA**

No abstract.

Indiana Rail Planning Report.

Indiana University, Bloomington Vol. 1, Aug. 1974, 218 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147907

**USRA SEGMENTS IN INDIANA**

No Abstract.

Indiana University, Bloomington Vol. 2, Jan. 1975, 81 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147908

**INDIANA STATE RAIL PLAN. PHASE 1**

No abstract.

Indiana University, Bloomington May 1975, 116 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147909

**INDIANA STATE RAIL PLAN: PRELIMINARY PHASE II. VOLS 1, 2 AND SUPPLEMENT**

No abstract.

Indiana University, Bloomington Oct. 1975, 604 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 147910

**INDIANA STATE RAIL PLAN: FINAL PHASE II**

No abstract.

Indiana University, Bloomington Jan. 1976, 279 pp

ORDER FROM: Indiana University, Bloomington 400 East Seventh Avenue, Bloomington, Indiana, 47401

25 148257

**INCENTIVES IN A METROPOLITAN PUBLIC TRANSPORTATION SYSTEM**

Existing public-transportation systems employ out-of-date, inefficient technology. This situation has not arisen through the lack of improved technology. Rather, it is the result of inherent disincentives which act to force systems in a counter-productive direction. This is an account of a recent study of the finances and operation of the metropolitan-Boston public transportation system (the MBTA). The existing legislation, which has elements in common with that for many other communities around the nation, was found to have widespread disincentives to productivity for all participants. New legislation introducing strong incentives to maximize

efficiency at all levels has been drafted and is reviewed here.

Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976. See also RRIS 04 148248.

Wilson, DG (Massachusetts Institute of Technology)  
American Society of Mechanical Engineers Conf Paper Paper R&L-3,  
1976, 7 pp, 16 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ASME

25 200082

**CONNECTICUT MASTER TRANSPORTATION PLAN-1972**

This report discusses the effort being expended in the development of a better integrated transportation system. Capital improvement costs for each mode based on preliminary cost estimates using 1971 prices. The cost of the system discussed is \$6.4 billion by the year 1990. Most important, the report emphasizes the fact that the development and implementation of a transportation plan is the responsibility of all levels of government. Implementation will require a great deal of cooperation and coordination on the part of those who have an obligation to improve transportation and the environment, including federal, state and town governments, regional planning agencies, transit districts, councils of elected officials and chambers of commerce, as well as other agencies and private citizens who are willing to get involved in districts, councils of elected officials and chambers of commerce, as well as other agencies and private citizens who are willing to get involved in a constructive manner. /FHWA/

Connecticut Department of Transportation Dec. 1971, 75 pp

ACKNOWLEDGMENT: Federal Highway Administration

26 094197

**TRAVEL HABITS AND PATTERNS. VOLUME 2. 1974-1975 (A BIBLIOGRAPHY WITH ABSTRACTS)**

This two volume work is devoted to U.S. travel patterns and habits primarily in urban areas. Presented are discussions on mass transit, modal choices and split, parking, park and ride, and commuting. Disadvantaged, disabled, student, and various age groups are studied along with recreational data. References are made to dial-a-ride, dual mode, car pooling, taxicab, railroad, rapid transit railways, and aircraft. (Contains 112 abstracts)

See also NTIS/PS-76/0025.

Adams, GH

National Technical Information Service Report Jan. 1976, 117 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS Repr. PC, Microfiche

NTIS/PS-76/0026/5ST, DOTL NTIS

26 094203

**DIESEL EXHAUST EMISSIONS (A BIBLIOGRAPHY WITH ABSTRACTS)**

All aspects of exhaust gases from stationary and vehicular diesel engines are presented. This includes their pollution potential, composition, control, and formation processes in combustion reactions. The effects of achieving better fuel consumption on the types of exhaust gases formed is covered. Also cited is research concerned with the health effects of these exhaust gases. (This updated bibliography contains 114 abstracts, 29 of which are new to this edition).

Supersedes NTIS/PS-75/139.

Lehmann, EJ

National Technical Information Service Report Jan. 1976, 119 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS Repr. PC, Microfiche

NTIS/PS-76/0007/5ST, DOTL NTIS

26 130204

**RAILROAD LITERATURE 1968 [Zheleznodoroznaia Literatura SSSR-1968]**

"Railroad Literature 1968" is a regular publication of the annual bibliographical indices of literature issued by the USSR Ministry of Railroads. The present index, as the previous ones, reflects the literature about the state and development of USSR railroad transport, leading production experience, and the most important technical-economic problems of transport. The index begins with USSR Communist Party directives on railroad transport, and the role of the C.P. in the struggle to improve railroad transport, including party political and Komsomol work. The index goes on to cover such general topics as the history of development of railroad transport, science, and technology, including the history of the revolutionary movement in railroad transport, railroad economics (e.g. planning, finances, tariffs, bookkeeping), interaction of various types of transport, work (e.g. salary and normalization of work, work productivity, socialistic competition), foreign railroad economics, scientific research, and preparation of cadres for rail transport training (e.g. line positions, middle and higher technical professions and technical propaganda). The index goes on to cover numerous other areas of railroad transport, such as materials, construction, planning, subgrade, upper track structure, current track repair, civil and industrial buildings, train stations, rolling stock and traction, electrified railroads, underground railroads, automation, remote control, communication, dispatching, etc. The final portion of the index is concerned with train traffic safety, safety technology, industrial rail transportation, specially constructed railroads, high speed lines, and cargo and commercial railroad operation, including transport law. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1970, 477 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

26 130212

**USSR RAILROAD LITERATURE, 1965 [Zheleznodoroznaia Literatura SSSR, 1965]**

Railroad Transport Literature 1965 is a regular publication of the annual bibliographical indexes of literature issued by the USSR Ministry of Railroads. This index presents, as do the previous ones issued in 1940 and 1940-64, literature on the condition and development of railroad transportation in the U.S.S.R., loading production experience, and the most important technical-economic problems of transport. The literature published in 1965 reflected the tasks of railroad transport in the light of the decision of the 23rd conference of the USSR Communist Party and its programs, especially regarding fulfillment of the seven-year plan (1959-65); the index includes railroad transport literature published abroad, as well as literature published in the USSR during 1965 and the end of 1964. The annual presents local as well as central publications of the organizations of the Ministry of Railroads, central administrations, planning organizations, scientific research institutes, scientific-technical societies, higher educational institutions, road enterprises, etc., and also work on railroad transport published by various non-transport organizations. The index includes descriptions of books, articles from collections, journals, and continuing publications such as "Labors", "Scientific Notes", etc., separate chapters, of books, rationalization propositions, materials for the exchange of experience, standards, norms, authors' documentation and patents for inventions, translations, papers, and overviews of foreign literature. Not included in the index are materials of a methodological educational character for higher and middle educational institutions and networks which prepare cadres for the mass professions, and also posters. [Russian]

Abstract only is available in English, original untranslated as of November 1976.

USSR Ministry of Railways 1967, 432 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: Transport Publishing House USSR Ministry of Transport, Moscow, USSR

26 130275

**TRANSPORT AND COMMUNICATIONS [Transport i Sviaz]**

This is a compendium of numerous tables, including the following: Freight traffic handled by all modes of general transport; passenger traffic; net cost of rail, water and highway transport; length of railroads by republics; individual loads; passengers handled; rail traffic density; cargo density; rolling stock utilization; number of workers and productivity; freight traffic and commodities delivered to industrial enterprises; basic indicators of sea transport; cargo transport by sea; fishing fleet freight traffic and commodities; river transport; extension of inland waterways by republic; main pipeline routes; buses; passenger transportation in cities and suburbs and mass transport by people by buses, taxis, trolley buses, streetcars, subways and finally, air transportation. [Russian]

From the Book "National Economy of the USSR in 1974 (Narodnoe Khoziaistvo SSSR 1974)-Abstract only is available in English, original untranslated as of November 1976.

Statistika 1974, pp 471-509, 59 Tab.

ACKNOWLEDGMENT: FRA

ORDER FROM: Statistika Kirova ul. 39, Moscow, USSR

26 133285

**NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES**

No abstract available.

Set includes PB-251 642 thru PB-251 653.

New York City Transit Authority Mar. 1975, 2204 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-251641-SET/ST, DOTL NTIS

26 133324

**RAILROAD RESEARCH BULLETIN, SPRING 1976. VOLUME 3, NUMBER 1**

The publication contains 1,110 abstracts of journal articles and research reports from current railroad literature and 418 summaries of ongoing research activities in the railroad field. The material covers the entire range of railroading from technology to operations, management, economics and

government involvement. Literature sources are worldwide. The material is arranged according to the RRIS (Railroad Research Information Service) classification scheme in two separate sections, one for journal and report abstracts and computer program descriptions, and one for ongoing project summaries. This publication supplements material in the six prior Railroad Research Bulletins which should be retained for a complete file of RRIS data. The material in the six previous Bulletins can be searched through the RRIS Cumulative Subject Index, 1973-1975, PB-249 716, which also gives information about the individual publications.

Also pub. as ISSN-0097-0042. See also PB-246 648.

Transportation Research Board, Federal Railroad Administration Bibliog.  
RRIS-7601, FRA/ORD-76/144, 1976, 323 pp, Refs.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS TRB Publications Off

PB-252014/6ST, DOTL NTIS

26 137424

**THE EFFECTIVENESS AND FEASIBILITY OF A NETWORK OF TRANSPORTATION RESEARCH INFORMATION SERVICES (TRISNET) REGIONAL CENTER IN INFORMATION TRANSFER**

The National Network of Transportation Research Information Services (TRISNET) will include a series of regional centers to provide local access to the network and loans and photocopies of transportation documents cited in the TRIS abstracting/indexing services. This project investigated the role of the regional center through the offer of services to the transportation community (state and local government and private industry) in the Chicago metropolitan area. The study of user behavior patterns and acceptance of individual services establishes regional center functions: document delivery, TRIS-On-Line searches, referral to other TRISNET components and user feedback to TRISNET management. Regional centers should be located in areas of diversified transportation activity, capitalizing on existing general transportation information resources. Additional recommendations include regional center funding, charges, marketing and specialized products for TRISNET.

Gustave, JR Libman, A Jacobson, B Silva, J Roy, M  
Northwestern University, Evanston, Department of Transportation Final Rpt. DOT/TST/76/36, Oct. 1975, 39 pp

Contract DOT-OS-50090

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-255489/7ST, DOTL NTIS

26 139541

**BIBLIOGRAPHY ON RAILWAY SIGNALLING 1960-1972**

No Abstract.

Mackay, NAM Martin, BD

Canadian Institute of Guided Ground Transport No. 73-9, No Date, 50 pp

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

26 141445

**VIBRATIONS IN TRANSPORT VEHICLES. BIBLIOGRAPHICAL STUDY. CRITIQUE [Environnement vibratoire dans les vehicules de transport. Etude bibliographique. Critique]**

No Abstract. [French]

Institute of Transport Research Bibliog. IRT Rept. N.12, Dec. 1975, 53 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: Institute of Transport Research Avenue du General Malleret-Joinville, Boite Postale 28, 94 Arcueil, France

26 142265

**BIBLIOGRAPHY OF INVESTMENT COSTS, OPERATING COSTS, AND RELATED ECONOMIC INFORMATION FOR THE MINERAL INDUSTRIES, JANUARY-DECEMBER 1975**

This report, covering the period January through December 1975, contains abstracts of articles concerning all phases of cost engineering and economics

for chemicals processing, mining, and other mineral industries. The bibliography has a major emphasis on energy-related activities, and many abstracts give investment and operating costs for synthetic fuels plants, oil and gas exploration and production, underground and surface coal mining and reclamation, and nuclear and conventional power generation facilities. Some other subjects covered include cost estimating methods and theory, reports on construction projects in the United States and abroad, developments in the environmental control segment of the energy economy, progress in solar and geothermal energy development deep ocean mining, and logistics in the energy market.

Sabatini, J Conley, LA

Bureau of Mines Biblio. 1976, 58 pp

ACKNOWLEDGMENT: Bureau of Mines

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

GPO-024004018810

26 142516

**UNITED STATES TRANSPORTATION ZONE MAPS**

No Abstract.

Federal Railroad Administration Maps Item 701-B, 1975

Contract DOT-FR-40012

ACKNOWLEDGMENT: Government Printing Office

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

TD3.2:M-32

26 142517

**CENSUS BUREAU GUIDE TO TRANSPORTATION STATISTICS**

First undertaken in 1963 and 1967. The 1972 census of transportation was the third such census...taken as three separate surveys, each on a sample basis...published in three distinct series of reports.

Wright, DG Davis, ES

Department of Commerce Statistics Item 146-A, 1976, 88 pp

ACKNOWLEDGMENT: Government Printing Office

ORDER FROM: Government Printing Office Superintendent of Documents, Washington, D.C., 20402

C 3.6/2:T 68

26 143186

**AN OVERVIEW OF FEDERAL TECHNOLOGY TRANSFER**

Federal technology transfer consists of those processes whereby research knowledge is transferred operationally into useful processes, products or programs that fulfill actual or potential public or private needs. These interests can be either vertical (from one governmental or industry level to another) or horizontal (from one functional area to another). To achieve effective transfer of technology into public sector areas frequently involves participation of both general-purpose and functional governmental agencies. Several factors contribute to effective R&D application: awareness of user needs, user technical sophistication, supplier technical sophistication, reduction of risk aversion tendencies, market aggregation, and program coordination. A number of mechanisms are available to accomplish this, including direct assistance, tailored documents, training, demonstrations, etc.

Prepared in cooperation with Federal Council for Science and Technology, Washington, D.C. Committee on Domestic Technology Transfer.

Linhares, AB

Department of Transportation, Federal Council for Science and Technology Final Rpt. DOT-TST-76T-1, June 1976, 30 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-255693/4ST, DOTL NTIS

26 143989

**RAILROAD SAFETY RESEARCH**

This Special Bibliography prepared from the magnetic-tape files of the Railroad Research Information Service, contains selections which were accessioned between 1973 and 1976. Although the literature in a few cases

dates back three decades, all listings are considered pertinent to contemporary railroad safety problems. The volume is divided into three main categories: Improved track structures research; Rail vehicle safety research; and Improved inspection, detection and testing research. There are 4,368 listings, involving 3,131 abstracts of research reports and journal articles, and descriptions of computer programs with some individual citations. The categories are based on the functional responsibilities of the groups comprising the staff of the FRA Office of Rail Safety Research.

Prepared for Annual Railroad Engineering Conference (13th) Held at Pueblo, Colorado in October 1976. See also report dated, Oct 75, PB-252 968.

Transportation Research Board, Federal Railroad Administration Biblio. RRIS-76S1, FRA/ORD-76/280, Dec. 1976, 686 pp

Contract DOT-OS-40023

ACKNOWLEDGMENT:  
ORDER FROM: NTIS

PB-258066/OST, DOTL NTIS

**26 145915**  
**SNOW STUDIES, VOLUME 2, 1975-OCTOBER 1976 (A BIBLIOGRAPHY WITH ABSTRACTS)**

The bibliography covers research on snow cover, snowmelt, snowdrifts, snow removal, trafficability, snow rescue and survival, physical and mechanical properties, as well as detection by remote sensing. Applications include construction of roads, runways, buildings, pipe lines, etc., in cold, remote, arctic or subarctic regions. (This updated bibliography contains 127 abstracts, 86 of which are new entries to the previous edition.) See also NTIS/PS-76/0808, Snow Studies, Vol. 1, 1964-1974.

Supersedes NTIS/PS-75/719, and NTIS/PS-75/042.

Brown, RJ  
National Technical Information Service Biblio. Oct. 1976, 132 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PS-760809/4ST, DOTL NTIS

**26 145916**  
**SNOW STUDIES, VOLUME 1, 1964-1974 (A BIBLIOGRAPHY WITH ABSTRACTS)**

The bibliography covers research on snow cover, snowmelt, snowdrifts, snow removal, trafficability, snow rescue and survival, physical and mechanical properties, as well as detection by remote sensing. Applications include construction of roads, runways, buildings, pipe lines, etc., in cold, remote, arctic or subarctic regions. (This updated bibliography contains 211

abstracts, none of which are new entries to the previous edition.)

Brown, RJ  
National Technical Information Service Biblio. Oct. 1976, 216 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PS-760808/6ST, DOTL NTIS

**26 147580**  
**TRANSPORTATION AND DISTRIBUTION OF FRESH FRUITS AND VEGETABLES: A BIBLIOGRAPHY**

This bibliography, organized by subject, contains sources of information on the transportation and distribution of perishable foods in the United States. The listing of source material was compiled as part of a long-term study, not yet completed, evaluating the present distributor system for such commodities.

This document was sponsored by the FRA and the National Bureau of Standards. Manalytics, Incorporated was the prime contractor; Reebie Associates of Greenwich, Conn., was the subcontractor.

Schrier, E Ainsworth, DP  
Manalytics, Incorporated Biblio. FRA-OPPD-76-6, Apr. 1976, 62 pp, 518 Ref.

Contract DOT-FR-65024

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL RP

**26 148247**  
**INTERSOCIETY CONFERENCE ON TRANSPORTATION 4TH ANNUAL, PROCEEDINGS, 1976**

The Proceedings contain 100 papers and 69 abstracts of paper presented at the Conference. Broad topic areas covered include policy and planning, design and operation, total environment, energy and fuels, command and control, regulation and legislation. Each of these topic areas provides the background against which various aspects of every form of transportation is discussed, including demand forecasting, mass transit, bicycle transportation, group and personal rapid transit, capital costs, freight handling, energy conservation, vehicle design, pavements, noise, traffic engineering, and others. Selected papers are indexed separately.

The conference, sponsored by the Intersociety Committee on Transportation, was held in Los Angeles, California, July 18-23, 1976.

American Society of Mechanical Engineers Proceeding 1976

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

# Ongoing Research Summaries

00 038648

## DEVELOPMENT AND TESTING OF NEW TUNNEL SUPPORTS

The objective is to make the construction of transportation tunnels faster, safer and less costly. Improvement in the design and construction of the opening is approached in two ways: measurements are being made on tunnels in Washington, D.C. during and after construction to determine how ground movements are related to construction procedure and geology; and finite element analyses are performed that will allow the simulation of realistic ground conditions with time dependent behavior and the sequence of excavation and support. The analysis can be tested with the field measurements and used to predict behavior of tunnels with different ground conditions and excavation and support sequences. Tests are being performed and analysis techniques developed relevant to the structural behavior of cast-in-place and segmented concrete tunnel liners subjected to various simulated ground loadings. Part of the effort on cast-in-place liners concerns the structural behavior and material development for an extruded liner system. This liner would be placed directly behind the excavation and serve both primary and secondary support functions. It would use rapid-set cement concrete and fiber reinforcement.

### REFERENCES:

Research to Improve Tunnel Support Systems Paul, S; Kesler, C; Gaybrd, E; Mohraz, B; Hendron, A,; University of Illinois at Urbana-Champaign, FRA-ORDD-74-51, June 1974

Concrete for Tunnel Liners; Behavior of Steel Reinforced Concrete Under Combined Loads, Herring, KS; Kesler, CE, University of Illinois at Urbana-Champaign, FRA-ORDD-75-7, Aug. 1974

Concrete for Tunnel Liners: Evaluation of Fiber Reinforced Quick Setting Cement Concrete, Halvorsen, GI; Kesler, CE,; University of Illinois at Urbana-Champaign, FRA-ORDD-75-3, Aug. 1974

Tunnel Design Considerations: Analysis of Medium-Support Interaction, Ghaboussi, J; Ranken, R, University of Illinois at Urbana-Champaign, FRA-ORDD-75-24, Nov. 1974

Concrete for Tunnel Liners: Behavior of Fiber Reinforced Quick Setting Cement Concrete, 75-87, Aug. 1975

Concrete for Tunnel Liners: Pumpable Fiber Reinforced Concrete, 75-88, Aug. 1975

Concrete for Tunnel Liners: Mix Design Recommendations for Prototype Extruded Liner System, 75-89, Aug. 1975

PERFORMING AGENCY: Illinois University, Urbana, Board of Trustees  
INVESTIGATOR: Cording, EJ (Tel (217)333-3823) Hendron, AJ (Tel (217)333-3823) Kesler, CE (Tel (217)333-3823)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Lucke, WN (Tel 202-4260808)

Contract DOT-FR-30022

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1973 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$400,000

ACKNOWLEDGMENT: TRAIS (PR# 73-65), Illinois University, Urbana

00 045960

## ANALYTICAL TECHNIQUES FOR SAFETY AND PERFORMANCE OF SUBSURFACE TRANSPORTATION STRUCTURES

The contractor shall perform and report on the following: Task 1. The prior work of the Principal Investigator shall be specialized for the specific case of the tunnel lining of circular cross-section. Task 2. The prior work of the Principal Investigator shall be extended to include the case of the tunnel lining of horseshoe shaped cross section. Task 3. The system of a linkage of

prefabricated structural elements forming a tunnel lining shall be studied. Task 4. An in-situ test of a tunnel structure under construction shall be conducted. STATUS: To date the results include: (1) An analytical technique has been developed for the prediction of loads on tunnel linings of both circular and horse-shoe cross-section. Input to these techniques include only the measured deformations to the tunnel wall; both have been computerized for ready application. (2) "Error of measurement" analyses, designed to establish limits on the precision of measurement have been conducted and concluded. (3) A physical model of a circular tunnel lining has been built for laboratory study. Included in the model are instruments for both the application of specific loads and the measurement of the deformation response.

### REFERENCES:

Analytical Techniques for Safety and Performance of Underground Structures, 1st Ann Conf, DOT Res & Dev in Tunneling Tech., May 1975

Using the Culvert as a Transducer FCP Res & Dev Conf, FHWA, Minneapolis, Minn., Sept. 1975

PERFORMING AGENCY: California State University, Sacramento, Department of Civil Engineering

INVESTIGATOR: Gabriel, LH

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-426-9638)

Contract DOT-OS-40016 (CS)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1974 COMPLETION DATE: June 1977 TOTAL FUNDS: \$76,711

ACKNOWLEDGMENT: TRAIS (PR# PUR-2-40569)

00 046488

## NATIONAL INFORMATION SERVICE FOR EARTHQUAKE ENGINEERING

It is the purpose of this center to collect and organize all the research information currently available on earthquake engineering and related areas. This will provide the first opportunity to collect, and assess information from many different sources and at the same time be a single source for researchers in the field to obtain information from a comprehensive collection. This will be geared to meet the needs of both academic researchers and design engineers. The library will consist of reports (both published and unpublished), site visit records, data collected from various seismic regions, an abstracting service and potentially as a basis for a technical journal directed to the needs of earthquake engineers.

This grant is the fourth year support for GI-28098X. It is a companion to Grant GK-28349X to University of California at Berkeley.

PERFORMING AGENCY: California Institute of Technology, Division of Engineering and Applied Science

INVESTIGATOR: Hudson, DE

SPONSORING AGENCY: National Science Foundation, Division of Advanced Environmental Research and Technology, GI-28098X3

Grant GI-28098X

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1973 COMPLETION DATE: Mar. 1977

ACKNOWLEDGMENT: Science Information Exchange (GSE 3202 2)



00 047346

**UTILIZATION OF SIMULATION MODEL FOR ANALYSIS OF TUNNEL CONSTRUCTION**

This project provides for the utilization of the Tunnel Cost Model in collaboration with various sectors of the tunnel industry. Four industry sectors have been identified for this project: contractors, estimators, owners, and engineers. At least one participating firm or agency from each of these sectors is included in the project. Objectives of the program are to demonstrate and enhance the model's applicability to each of these sectors, using as case studies hard rock tunnel projects currently active and of interest to one or more of the participants. Direct industry participation in the program will continue the expertise of consulting geologists, cost estimators, project managers, and tunnel supervisors to the design of the case studies and the interpretation of results.

**REFERENCES:**

Tunnel Cost Estimating Under Conditions of Uncertainty Wyatt, RD, R75-13, June 1974, PB-242428/1ST

The Probabilistic Estimation of Construction Performance in Hard Rock Tunnels, Minnott, CH, R74-47, Sept. 1974, PB-242427/3ST

Tunnel Cost Model: Professional Papers 1974 Moavenzadeh, F, R74-4, May 1974, PB-243253/2ST

Tunnel Cost Model: A Stochastic Simulation Model of Hard Rock Tunneling. Volume 1. Summary Report, Moavenzadeh, F, R74-22, May 1974, PB-243252/4ST

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Moavenzadeh, F

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, GI-34029A1

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1974 TOTAL FUNDS: \$235,400

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 219 2)

00 048898

**MUCK UTILIZATION IN THE URBAN TRANSPORTATION TUNNELING PROCESS**

The objective of this contract is to assess the problem of muck disposal as it emanates from the urban transportation tunneling process. An assessment was completed based on case histories of materials handling and muck utilization, possible uses of muck, interactions with subsurface investigations and muck properties. A draft handbook of guidelines was prepared and implemented in order to develop a muck utilization plan for the Mass Transit Administration (MTA) of Baltimore, Md. A final technical report and guidelines will be printed at the end of the contract.

PERFORMING AGENCY: Haley & Aldrich, Incorporated

INVESTIGATOR: Liu, TK (Tel 617-4926460)

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Saulnier, G (Tel 617-4942092)

Contract DOT-TSC-836

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$186,203

ACKNOWLEDGMENT: TRAIS (PR# TM-0013), TSC

00 048930

**STUDY OF FEASIBILITY OF LOCATING UTILITIES IN TRANSPORTATION TUNNELS**

The objective of this project is to accomplish the following items of work: Investigate the various types of utility lines, such as main trunk, feeder and branch lines in urban utility networks defining the most probable sets that would be applicable for inclusion with a cut-and-cover transportation tunnel and assessing relative technical and economic feasibility of the designs developed in Item 1. The institutional factors involved in determining the acceptance or rejection of the concept of providing for utilities in cut-and-cover transportation tunnels will be examined. A detailed analysis shall be made of the economic, technical and institutional factors involved with integrating utilities with a specific cut-and-cover tunnel.

**REFERENCES:**

Combined Utility/Transportation Tunnel Systems - Economic, Technical and Institutional Feasibility, Huck, PJ; Iyengar, MN; Makeig, KS; Chipps, J, Dec. 1975

PERFORMING AGENCY: IIT Research Institute

INVESTIGATOR:

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Larson, G (Tel (617)494-2300)

Contract DOT-TSC-794 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 TOTAL FUNDS: \$113,996

ACKNOWLEDGMENT: TRAIS, IIT Research Institute (PR# TMP-0151-ES), TSC

00 058302

**IMPROVEMENT OF PROBLEM TRACK SUBSOIL BY THE LIME SLURRY PRESSURE INJECTION METHOD**

The ability of the Lime Slurry Pressure Injection (LSPI) stabilization technique to improve in-place railroad subgrades shall be examined. This study shall be directed toward developing the information requisite for field utilization of the promising LSPI stabilization technique. Emphasis shall be placed on verifying the concepts and premises on which the technique has been founded including delineation of those track and soil conditions under which LSPI is most effective. The study shall incorporate an evaluation of the present and past field performance of this track design criteria. Concurrent studies with regard to economic effectiveness and environmental impact shall be conducted to help provide a better guideline for future utilization.

**REFERENCES:**

Proceedings of Roadbed Stabilization Lime Injection Conference, Blacklock, JR, Nov. 1975, PB-251681

PERFORMING AGENCY: Arkansas University, Little Rock, Graduate Institute of Technology

INVESTIGATOR: Blacklock, JR (Tel 501-375-7247)

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel 202-426-4377)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1974 COMPLETION DATE: Mar. 1977

ACKNOWLEDGMENT: FRA

00 058353

**HYDRAULIC TRANSPORTATION AND SOLIDS SEPARATION OF EVACUATED MATERIALS IN TUNNELS**

Investigation of techniques and costs of hydraulic tunneling and transport of sand rock muck and in particular St. Peter Sandstone, which underlies much of the Minneapolis area. Investigations will be made of techniques for slurry/water separation by mechanical and/or chemical means. The purpose is to greatly minimize or eliminate the need for large settling ponds and to meet environmental requirements where open loop systems are used.

**REFERENCES:**

Hydraulic Transportation and Solids Separation of Excavated Materials in Tunnels, Nelson, CR; Yardley, DH, Apr. 1974

PERFORMING AGENCY: Minnesota University, Department of Civil and Mineral Engineering

INVESTIGATOR: Nelson, CR; Yardley, D; Hopstock, D; Christenser, L; Stefan, H

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: McFarland, RK

Contract DOT-OS-40087 (CS)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Mar. 1974 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$70,602

ACKNOWLEDGMENT: TRAIS (PUR-1-40075), Minnesota University, Minneapolis

00 058360

**HYDRAULIC WATER JET ASSISTED TUNNEL BORING**

The effectiveness of jet assisted tunneling will be assessed after laboratory testing. A boring machine will be designed and an economic evaluation made.

PERFORMING AGENCY: Colorado School of Mines

SPONSORING AGENCY: Office of Systems Development and Technology,  
Department of Transportation  
RESPONSIBLE INDIVIDUAL: Doyle, J

Contract DOT-OS-40102 (CS)

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: Apr. 1974  
COMPLETION DATE: Apr. 1976 TOTAL FUNDS: \$100,000

ACKNOWLEDGMENT: Office of Systems Development and Technology

00 058433

**PARTICIPATION IN DOT TUNNELING RESEARCH PROGRAM**  
No Abstract.

PERFORMING AGENCY: Federal Highway Administration  
SPONSORING AGENCY: Office of Systems Development and Technology,  
Department of Transportation  
RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-4269638)

ID AS-50062

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Apr. 1975

ACKNOWLEDGMENT: Office of Systems Development and Technology

00 058434

**COST/BENEFIT ANALYSIS OF THE ELEMENTS OF THE DOT  
TUNNELING R AND D PROGRAM**  
No Abstract.

PERFORMING AGENCY: Federal Railroad Administration, Department of  
Transportation  
SPONSORING AGENCY: Office of Systems Development and Technology,  
Department of Transportation  
RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-4269638)

ID DOT-AS-50063

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Apr. 1975  
COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$35,000

ACKNOWLEDGMENT: TRAIS

00 058435

**REVIEW OF THE DEPARTMENT OF TRANSPORTATION  
TUNNELING RESEARCH AND DEVELOPMENT PROGRAM**  
No Abstract.

PERFORMING AGENCY: Federal Highway Administration, Department of  
Transportation  
SPONSORING AGENCY: Office of Systems Development and Technology,  
Department of Transportation  
RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-4269638)

ID AS-50060

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Apr. 1975

ACKNOWLEDGMENT: TRAIS

00 058470

**ASSESSMENT OF DISRUPTIVE EFFECTS ASSOCIATED WITH  
URBAN TRANSPORTATION TUNNEL CONSTRUCTION**

Effects of constructing both bored and cut and cover tunnels was considered. Effects from bored tunnels center on the impact of the construction of access shafts and cut and cover stations. The extent of the impact will depend on the spacing and the location of these relative to community services. Effects from cut and cover stations tend to follow a surface route within the urban area. Disruptive effects, therefore, may tend to be more concentrated in the former, but distributed in the latter. For each disruptive effect identified the currently used method(s) of measurement for determining that impact was identified. A preliminary approach to predicting and assessing the degree of each disruptive impact was developed. The study was expanded to collect real data and assess the completeness and validity of the approach developed by conducting a case study of tunnel construction on the MARTA system in Atlanta, Georgia.

Final Report: Phase A-No. UMTA-MA-06-0025-76-5, June 1976 is available from NTIS PB-256858.

PERFORMING AGENCY: ABT Associates, Incorporated  
INVESTIGATOR: Wolff, PC (Tel (617)492-7100)

SPONSORING AGENCY: Transportation Systems Center, Department of  
Transportation, UM-704

RESPONSIBLE INDIVIDUAL: Saulnier, G (Tel (617)494-2092)

Contract DOT-TSC-1018

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975  
COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$110,320

ACKNOWLEDGMENT: TRAIS

00 058496

**TESTS OF CONCRETE TUNNEL LINER SEGMENT EDGE  
SEALANT**

Tasks include: 1-Evaluate the effect of compressive stress levels of 300, 600, and 1200 lb in (sq.) on the sealant to determine if satisfactory fusion can be achieved and the tensile strength and extensibility of the fusion obtained. 2-Evaluate the deformation of the sealant at the various compressive stress levels and the effect of lateral flow of the sealant on this liner. 3-Determine the hydrostatic pressure resistance of the sealant, particularly the effectiveness of the sealant fusion at the junction of four liner segments.

PERFORMING AGENCY: Bureau of Reclamation  
SPONSORING AGENCY: Office of Systems Development and Technology,  
Department of Transportation  
RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-4269638)

IA DOT-AS-50061

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: May 1975

ACKNOWLEDGMENT: TRAIS

00 058679

**URBAN TRANSPORTATION TUNNELING FORECAST**

A primary objective of this analysis is to investigate the future transportation requirements of U.S. urbanized areas and to determine probabilistic estimates on the levels of tunneled transportation construction that may occur in these areas during the next two decades. The analysis will concentrate on how the new construction requirements for urban passenger transportation systems. As a result of this analysis, improved information on future extents and associated costs of tunneling construction that may be expected to occur in the U.S. during the next two decades will be developed.

PERFORMING AGENCY: Systan, Incorporated  
SPONSORING AGENCY: Transportation Systems Center, OS-552  
RESPONSIBLE INDIVIDUAL: Thibodeau, R (Tel (617)494-2389)

Contract DOT-TSC-1075 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975  
TOTAL FUNDS: \$149,022

ACKNOWLEDGMENT: TRAIS (OS-552)

00 058689

**ECONOMICS OF THE TUNNELING INDUSTRY**

Objectives are: 1. Indicate the size of the industry and recent trends in aggregate supply and demand for tunneling services. 2. Identify the functions performed in the industry by following a typical project through the planning, design, contract, and construction stages. Identify the types of firms in the industry and which functions they perform. 3. Determine the size of these firms, the importance of tunneling to their overall operations, the degree of concentration in the industry and their organizational status. 4. Determine the professional positions existing in each type of firm, and the skills required. Identify the supply of such professionals and numbers. 5. Describe the current status of the markets for personnel and capital funds.

PERFORMING AGENCY: Cresheim Company  
SPONSORING AGENCY: Transportation Systems Center, Department of  
Transportation, OS-552  
RESPONSIBLE INDIVIDUAL: Thibodeau, R (Tel (617)494-2389)

Contract DOT-TSC-1091 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975  
TOTAL FUNDS: \$96,786

ACKNOWLEDGMENT: TRAIS

00 058755

**STAND-UP TIME OF TUNNELS IN SQUEEZING GROUND**

Objectives are to develop a fundamental understanding of the relationship between the size of an advancing tunnel face and the stand-up time in squeezing ground, as well as to develop a stand-up time predictive capability. The first phase will include: 1. Describe and identify case histories where stand-up time problems have been encountered. 2. Develop a set of properly scaled physical model materials. 3. Perform three-dimensional physical model tests. 4. Identify material properties to be used in predicting ground behavior. 5. Identify to what extent numerical methods can be used to model ground behavior. STATUS: During the first year, a survey of case histories leading to the experimental work was completed. In addition, existing computer codes used in present numerical modelling techniques were identified. Concurrently, a sand-wax material has been adopted as the scaled physical model, and its deformation properties have been indexed. In creep and compression tests this compound material exhibits a response consistent with viscoelastic theory. Accordingly a non-linear visco-elastic material model will be developed utilizing necessary modifications to existing finite element computer techniques. Construction of a physical model test chamber has been completed. This chamber and its auxiliary equipment will permit close examination of constant strain rates and creep levels in the sand-wax material.

PERFORMING AGENCY: California University, Berkeley, Department of Civil Engineering

INVESTIGATOR: Brekke, TL

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-4269638)

Contract DOT-OS-50108

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$146,941

ACKNOWLEDGMENT: TRAIS, OST

00 058758

**DESIGN METHODOLOGY FOR SOFT GROUND GROUTED TUNNELS**

This research is for development and experiments to determine a rational basis for the design of grouted tunnels. Objectives are: 1. Perform field grouting trials using several different grouts, in varying soil conditions, to determine the degree to which the grout spreads, field strengths of the grouted soil, and aging effects of grouted soils. 2. Perform laboratory tests of soils grouted in the field trials to identify the soils, establish stress strain properties and strength, and determine permeabilities. 3. Develop a finite element program to analyze movements and stresses around grouted tunnels. 4. Apply the finite element analysis to a field case history. STATUS: Laboratory testing, field testing, and analytical studies are involved in the work, and all of these phases are currently under way. Specific results to date include: 1) A fully developed finite element program capable of realistically modelling the problems of tunneling and excavation through or adajement to chemically stabilized zones of soil. 2) Parametric studies using the finite element program showing the effects of growth zone size, and strength of surface subsidence above tunneling operations. 3) Development of a laboratory procedure for creating consistent samples of chemically stabilized soils. 4) 80 laboratory load tests on chemically stabilized soil samples illustrating the effects of confining pressure, soil water content, and rate of loading. 5) Publication of a report describing European and English stabilization techniques, costs and quality control procedures. 6) Field grouting trials involving injection of different types of grouts. Sampling and testint of grouted zones is underway. 7) Development of on-site testing equipment, and the use of this equipment in monitoring grouting work for Washington, D.C.'s Metro System.

## REFERENCES:

Observations of Chemical Stabilization Practice in England and Europe, Clough, GW, Report to DOT, July 1976

European Practice in the Use of Chemical Stabilization Systems for Soft Grout Tunneling, Clough, GW, Rapid Excavation & Tunneling Conf, Proc, Las Vegas, Nev., July 1976

PERFORMING AGENCY: Stanford University, Department of Civil Engineering

INVESTIGATOR: Clough, GW

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-4269638)

Contract DOT-OS-50123

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$117,119

ACKNOWLEDGMENT: TRAIS, OST

00 082170

**INSTRUMENTATION OF TUNNELS AND BRACED EXCAVATIONS OF THE WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY**

Measurements of ground movements and lining behavior have been made during construction of tunnels in rock and soil, large underground rock chambers, and braced excavations in Washington, D.C. Results are being used to monitor construction, and improve design of tunnels and braced excavations. Results have been analyzed and compared with analytical studies and other case histories.

PERFORMING AGENCY: Illinois University, Urbana, Department of Civil Engineering

INVESTIGATOR: Cording, EJ Hansmire, WH O'Rourke, TD Mahar, JW Jones, RA

SPONSORING AGENCY: Washington Metropolitan Area Transit Authority

Contract IZ6002

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1970 TOTAL FUNDS: \$500,000

ACKNOWLEDGMENT: Illinois University, Urbana, Smithsonian Science Information Exchange (BJ 51, AN 9233)

00 082313

**PRETHAWING PERMAFROST AND CONSOLIDATION IN PREPARATION FOR CONSTRUCTION**

The aim of this study is to develop efficient and economical methods of prethawing permafrost, and establish criteria for preconsolidation and stabilization of such soils to achieve range of bearing capacities applicable to roads, airfields, pipelines and foundations, including dams and bridges. Literature and data from related research will be reviewed and analyzed. Theoretical and laboratory studies will be conducted to optimize methods of pre-thawing, facilitate heat transfer, remove excess pore pressure and consolidate the soils. Field and laboratory studies will be conducted on stabilization, shear strength and bearing capacity of thawed soils, with and without surcharge loadings, and treatment with chemical and cement grouts.

PERFORMING AGENCY: Cold Regions Research and Engineering Laboratory, AT06-04-002

INVESTIGATOR: Croy, FE

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army, DA0J8151

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: June 1978 TOTAL FUNDS: \$195,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA108151)

00 100810

**RESEARCH IN LONG HOLE EXPLORATORY DRILLING FOR RAPID EXCAVATION UNDERGROUND**

Abstract: the goal of the proposed research is to provide the optimum drilling system or systems for exploration drilling well in advance of underground excavation projects. This system will be adaptable to different geological and hydrological conditions. The method will be adaptable to both drill and blast and mechanical boring methods of driving tunnels, with a greater emphasis on the latter method. Ideally, this drilling system will probe ahead four or five days and provide little or no interference to the excavation process. The principal objective will be to retrieve a meaningful sample, preferably an undisturbed core. An exploration drill will be designed which is capable of determining geological conditions and rock properties in advance of mechanical tunnel boring machines. A prototype drill will be fabricated and field tested. Capabilities of this drill include: operating in conjunction with mechanical tunneling machines with little or no interference; assembly, disassembly, and operation in a tunnel; ability to recover solid core samples; instrumentation to continuously monitor torque, rpm, and penetration rate; and lead the tunneling operation in hard rock by several days.

PERFORMING AGENCY: Jacobs Associates  
 INVESTIGATOR: Williamson, TN  
 SPONSORING AGENCY: Department of Defense, Advanced Research  
 Projects Agency, DD220127 H0220020

Contract  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July  
 1974 TOTAL FUNDS: \$68,858

ACKNOWLEDGMENT: Smithsonian Science Information Exchange  
 (GQQ220127 3)

**00 109558**  
**ACCELERATED CURING TEST FOR LIME AND LIME-FLYASH  
 STABILIZED SOILS**

The purpose of this project is to develop an accelerated curing test procedure to determine the most advantageous lime and lime-flyash percentages and the stabilization susceptibility of troublesome soils. Guidelines concerning performance and durability aspects of these stabilized materials will be evaluated. Existing published information concerning methods for rapidly determining optimum lime and lime-flyash stabilization percentages of soils will be collected, reviewed, and analyzed. A laboratory testing program will be conducted to evaluate the effects of time, temperature, and PH on the developed strengths of various soil-lime mixtures. /SIE/

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of  
 Engineers  
 INVESTIGATOR: Townsend, FC Gilbert, PA  
 SPONSORING AGENCY: Waterways Experiment Station, Army Corps of  
 Engineers, DA05F8182

STATUS: Active NOTICE DATE: Feb. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA  
 681821)

**00 110036**  
**STABILIZATION OF STEEP LAND SLOPES**

Field studies are being conducted to develop practical and economical measures and methods to reduce or to stabilize potential or existing landslides in southeastern Ohio. Detailed field measurements are being made at selected sites on the Eastern Ohio Resource Development Center. Proposed solutions will be developed primarily from laboratory and analytical models. Soil, Topographic, and other features will be related to control measures. Basic information for extending recommendations to similar areas will be developed by coordinating the results with those from state project 401. /CRIS/

PERFORMING AGENCY: Ohio State University, OHO00410-S; Ohio Agri-  
 cultural Research and Development Center, Department of Agricultural  
 Engineering  
 INVESTIGATOR: Schwab, GO  
 SPONSORING AGENCY: Department of Agriculture; Ohio Agricultural Re-  
 search and Development Center

STATUS: Active NOTICE DATE: Feb. 1977

ACKNOWLEDGMENT: Ohio State University, Ohio Agricultural Research and  
 Development Center, Smithsonian Science Information Exchange (GI  
 106706)

**00 110156**  
**ADHESION IN ROCKS**

An attempt is made to study and explain the mechanism of adhesion or cohesion at zones of weakness inside rocks. These forces operate at interfaces and indicate a relationship between fracture and the physical chemistry of surfaces. Initial efforts include an intensive review of pertinent literature including that relating to binding concrete and commercial adhesives and the study of grain boundaries in ceramics and metals which may also apply to rocks. The strength of adhesion at grain boundaries will be studied to determine if mechanical interlocking is the predominant mode of intragranular binding in igneous rocks. Variations in hardness at grain boundaries and cleavage planes will be determined and compared with similar measurements away from these areas. The relationship of grain size to the mechanical strength of a rock will be investigated by use of compression and tensile strength tests.

PERFORMING AGENCY: Bureau of Mines, Department of the Interior  
 INVESTIGATOR: Savanick, GA  
 SPONSORING AGENCY: Department of Defense, Advanced Research  
 Projects Agency, DD220089

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1972

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GTP 31  
 1)

**00 111514**  
**STRENGTH OF REPAIRED REINFORCED CONCRETE  
 STRUCTURAL MEMBERS**

This research project will investigate the properties of repaired reinforced concrete structural members. A series of structural members that have been severely damaged in earlier experimental investigations will be repaired using methods and materials considered to be the best available in the current state of the art. These members will then be retested to ascertain the effectiveness of the repair in restoring the original properties. The project will be accomplished in four steps: A study of information about available materials and techniques for repair; retesting of present specimens to obtain a comparison of load-displacement properties and degradation properties with those of the virgin specimens; testing of a new series of original, repaired and retested similar members; testing of a new column series. /SIE/

PERFORMING AGENCY: Michigan University, Ann Arbor, Department of  
 Civil Engineering  
 INVESTIGATOR: Hanson, RD  
 SPONSORING AGENCY: National Science Foundation, Division of Engi-  
 neering

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar.  
 1976 TOTAL FUNDS: \$43,700

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ  
 6251)

**00 115950**  
**A COMPREHENSIVE PROGRAM ON ROCK PROPERTIES,  
 TUNNELING AND EXCAVATION TECHNOLOGY AND  
 NUCLEAR BLAST EFFECTS ON EARTH MEDIA**

Fifth-year funding of continuation grant GI-34608x1 The goal is to establish a data center on properties of geological substances of interest to the geosciences in a manner useful for applications and research concerned with the use of underground space. The data center will be within the Thermophysical Properties Research Center. Data tables will be compiled, using published literature and reports, on thermal, mechanical, magnetic and electrical properties of geologic materials. Periodic data tables will also be produced on unconventional methods of tunneling and underground excavation technology as well as complete information on the methods, equipment, rates and costs for excavation of tunnels and underground openings. A minimal effort will be maintained in collecting data on blast effects on soils and rocks. One product will be an annotated bibliography of publications related directly to underground excavations in soil and rock.

PERFORMING AGENCY: Purdue University, School of Civil Engineering  
 INVESTIGATOR: Touloukian, YS  
 SPONSORING AGENCY: National Science Foundation, Division of Ad-  
 vanced Technology Applications, GI-34608X2; Department of Transporta-  
 tion

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1976 COM-  
 PLETION DATE: 1978 TOTAL FUNDS: \$62,800

ACKNOWLEDGMENT: National Science Foundation

**00 129708**  
**TRANSPORTATION TUNNELING PROGRAM**

DOT's Transportation Tunneling Program is designed to develop and demonstrate advanced techniques for constructing transportation tunnels, reduce costs by at least 30 percent and increase construction rates by 100 to 200 percent by the 1980's, and to minimize the environmental impact of tunnels. The program continues a comprehensive, coordinated investigation of new tunneling technology carried out through several groups at DOT including TST, FRA, UMTA, and FHWA. Areas of research activity within

the modal administrations include site investigation, ground movement prediction and control, cut and cover tunneling technology, novel excavation techniques (laser, water cannon), liner innovations, urban muck disposal, and the study of industry issues and problems. In addition, each mode works on special problems which are peculiar to its needs such as traffic controls, transition lighting.

No contract yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office for Systems Development and Technology

RESPONSIBLE INDIVIDUAL: McFarland, RK

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: FRA

00 129709

#### GUIDELINES FOR EXISTING SUBWAY MAINTENANCE

The objective of this contract is to assess current subway system tunnel maintenance practices and problems and to perform an initial evaluation of new equipment, materials, and techniques that can be utilized on operational systems and to help eliminate, at the design state, those situations which have contributed to subway system deterioration and maintenance problems. Two sets of guidelines, one for subway system operators and one for designers, will result from the contract.

PERFORMING AGENCY: Bechtel Corporation

INVESTIGATOR: Birkmyer, J (Tel 415-768-1009)

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Saulnier, G (Tel (617)494-2092)

Contract DOT-TSC-1078

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$174,233

ACKNOWLEDGMENT: TSC

00 129710

#### ECONOMIC FACTORS IN TUNNEL CONSTRUCTION

Develop a tunnel construction cost data base and cost estimating and systems analysis methodologies founded on this base.

PERFORMING AGENCY: Singstad, KEGHART, November & Hurka

INVESTIGATOR: Foster, E Toporoff, I

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Sluz, A (Tel 617-494-2019)

Contract DOT-TSC-1106

STATUS: Active NOTICE DATE: July 1976 START DATE: Dec. 1975 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$130,000

ACKNOWLEDGMENT: TSC

00 129711

#### THE TRANSPORTATION OF TUNNEL MUCK BY PIPELINE

This contract will advance the technology of tunnel excavation by increasing the rate of muck removal from the tunnel face. Areas of emphasis include: understanding of pneumatic solids flow, evaluation of alternate types of extensible components, and reduction at size and cost of dewatering systems.

PERFORMING AGENCY: Colorado School of Mines

INVESTIGATOR: Faddick, RR (Tel 303-279-0300 X370) Martin, JW

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Bosserman, B (Tel 617-494-2432)

Contract DOT-TSC-1114

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1975 TOTAL FUNDS: \$37,637

ACKNOWLEDGMENT: TSC

00 129712

#### TESTING PROGRAM FOR THE EXPERIMENTAL VERIFICATION OF A PNEUMATIC TRANSPORT SYSTEM FOR THE RAPID EXCAVATION

This contract provides funding for a field test program of a pneumatic muck pipeline system to test the reliability, wear and maintenance requirements, capacity, noise and dust levels, energy requirements and costs, effect of moisture content, and extensibility.

PERFORMING AGENCY: Colorado School of Mines

INVESTIGATOR: Faddick, RR (Tel 303-279-0300 x370) Martin, JW

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Bosserman, B (Tel 617-494-2432)

Contract DOT-TSC-1144

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 TOTAL FUNDS: \$91,065

ACKNOWLEDGMENT: TSC

00 130495

#### BALLAST AND FOUNDATION MATERIALS RESEARCH PROGRAM

This research study is concerned with development of a better methodology for considering ballast and foundation soils in the overall analysis and design of a railway support structure. A theoretical analysis model is being developed which is based on finite element theory and which will be able to more realistically consider the "stress-dependent" behavior of ballast and foundation materials. A number of different types of ballast and foundation materials will be subjected to various types of laboratory testing including repeated load triaxial testing. Laboratory test results and the theoretical analysis model will be used to identify material properties that are meaningful for evaluating potential material performance and to identify appropriate testing procedures for determining these properties. Ultimately, the research program will lead to development of rank ordering of ballast, subballast and foundation materials according to their potential in-service performance.

PERFORMING AGENCY: Illinois University, Urbana, Department of Civil Engineering

INVESTIGATOR: Thompson, MR (Tel (217)333-3930) Ireland, HO Hay, WW

SPONSORING AGENCY: Association of American Railroads Technical Center

RESPONSIBLE INDIVIDUAL: Martin, GC (Tel (312)567-3588)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BG 885)

00 130952

#### UNDERGROUND EXCAVATION AND ROCK PROPERTIES INFORMATION

The goal is to establish a data center on properties of geological substances of interest to the geosciences in a manner useful for applications and research concerned with the use of underground space. The data center will be within the Thermophysical Properties Research Center. Data tables will be compiled, using published literature and reports, on thermal, mechanical, magnetic and electrical properties of geologic materials. Periodic data tables will also be produced on unconventional methods of tunneling and underground excavation technology as well as complete information on the methods, equipment, rates and costs for excavation of tunnels and underground openings. A minimal effort will be maintained in collecting data on blast effects on soils and rocks.

This is a continuation of Grant No. GI-34608X2.

PERFORMING AGENCY: Purdue University, School of Engineering, Department of Mechanical Engineering

INVESTIGATOR: Touloukian, YS

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR75-15710

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$31,400

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 213 3)

00 130960

#### EFFECTS OF TIME, TEMPERATURE, AND CONCENTRATION ON THE ENGINEERING PROPERTIES OF POZZOLANIC STABILIZED SOILS

Time, temperature, and percentage of pozzolanic stabilizer, i.e., lime and/or lime-flyash, greatly affect the stabilization response of troublesome soils. The

objective of this investigation is to evaluate the effects of these variables on the stabilization response of various soils. It is anticipated that this research will permit rapid strength estimates of pozzolanic stabilized soils for mix designs and construction times. Existing published information concerning the effects of time, temperature, and percent additive on the strength of soils and current mix design procedures will be collected, reviewed, and analyzed. A laboratory program will be conducted to evaluate the effects of these variables and pH on the developed strengths of various soil-lime and soil-lime-flyash mixtures.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers  
 INVESTIGATOR: Townsend, FC Gilbert, PA  
 SPONSORING AGENCY: Waterways Experiment Station, Army Corps of Engineers, DA0F8182

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 68182 2)

#### 00 130961

##### ENGINEERING CLASSIFICATION OF COHESIONLESS SOILS

To develop correlations between engineering properties and quantitative descriptions to provide meaningful classifications of cohesionless soils. The indexes and correlations would be related to shear strength, compressibility, and other engineering properties. The development of the system should permit a more rapid and valid evaluation of the on-site selection and utilization of these materials. A literature review of previous work will be conducted to select variables thought to exert the greatest influence on the engineering properties of cohesionless soils. A laboratory testing program would be initiated to evaluate the significance of these variables on various engineering properties-i.e., shear strength, compressibility, and compaction. Subsequently, the data would be analyzed to provide correlations which would form the nucleus of a classification system and permit rapid estimations of the anticipated engineering properties.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers  
 INVESTIGATOR: Townsend, FC  
 SPONSORING AGENCY: Waterways Experiment Station, Army Corps of Engineers, DA0G8186

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 78186 1)

#### 00 130962

##### THEORY AND PRINCIPLES OF REINFORCED EARTH

Study the theory and principles of reinforced earth relevant to military construction and develop guidelines for the construction and develop guidelines for the construction of reinforced earth structures. Materials such as metal reinforcement and dry granular soil have been used to form reinforced earth. Previous investigations will be extended to include materials such as membrane reinforcement and cohesive soil backfill. The phenomena associated with soil reinforcement will be studied experimentally, both in the laboratory and in the field, and analytically.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers  
 INVESTIGATOR: Alhussanini, MM Perry, EB  
 SPONSORING AGENCY: Waterways Experiment Station, Army Corps of Engineers, DA0G8187

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 78187 1)

#### 00 130963

##### SOIL STABILIZATION

There is a need to develop and evaluate a chemical soil stabilization system for use in the expedient construction of military roads, airfields, and support areas in order to increase troop mobility and effectiveness. Such a soil stabilization system will enable the future army to achieve maximum mobility for its striking force, to lessen its logistic support load, and provide

a high degree of assurance of mission accomplishment in areas with marginal or poor soils. Laboratory and field investigations will be conducted to disclose potential soil stabilization materials and to determine the capabilities of developed processes to satisfy specific strength and durability requirements established for expedient military roads and airfields in support of various operational missions. Techniques will be developed and evaluated for both liquid and nonliquid soil additives.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers  
 INVESTIGATOR: Eaves, RC Culpepper, MM  
 SPONSORING AGENCY: Waterways Experiment Station, Army Corps of Engineers, DA0K5551

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA115551 1)

#### 00 130965

##### RAPID ASSESSMENT OF ROCK MASS CONDITIONS

To develop a technique for the rapid assessment of the integrity of rock slopes, tunnel rock, dam abutments, and embankments. Thermal anomalies associated with known structural defects and their significance will be evaluated with a portable infrared scanner. Techniques for the rapid evaluation of rock mass properties (deformation, strength, stress, etc.) will be investigated. Improvements of existing tools or the development of new tools will be made as required.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers  
 INVESTIGATOR: Huie, JS  
 SPONSORING AGENCY: Waterways Experiment Station, Army Corps of Engineers, DA0M8183

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA138183 1)

#### 00 133589

##### SCOUR RESEARCH

There is lack of any accepted method of predicting the depth of scour around bridge piers and abutments. The amount of scour to be expected may critically affect the design of bridge structures. The aim of this project is to observe and record magnitude of those most significant factors believed to be related to scours, such as: (A) contraction in the case of general scour or abutment scour; (B) depth of flow and mean velocity of flow that characterize the flow approaching the scour location; and (C) characteristics (mean diameter) of bed material particle size in the approach; observe and record the magnitude of scour, both general and local, during significant floods at selected bridges; analyze recorded scour and scour related data. Analysis would hopefully verify or help to modify presently available analytic techniques for evaluating probable scour at bridge crossings. Most of the effort during the fiscal year was directed toward completing analytical work on past data, reviewing recent works of other researchers, and in writing the final project report. Significant conclusions from the study are: (1) general scour formulas for long contractions proposed by Griffith (1939), Straub (1940), and Laursen (1958) compare favorably with measured values on gravel and cobble bed streams; (2) bed material size and pier width appear to be the dominant parameters in describing maximum equilibrium scour depth for piers with round or pointed noses.

PERFORMING AGENCY: Geological Survey, Water Resources Division  
 INVESTIGATOR: Norman, VW  
 SPONSORING AGENCY: Geological Survey, Water Resources Division, AK 64-036

In-House

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZUA 2849 1)

00 134775

**MECHANICAL TUNNEL BORING PREDICTION AND MACHINE DESIGN**

Research during the first two years has shown small-scale testing of small samples to be a valid representation of full-scale rock cutting. Thus samples from along a proposed tunnel alignment can be tested at a reduced scale and the results used to predict machine boring performance and to specify machine design parameters. These studies show that cutting performance is affected by factors such as cutter edge angle, wear and cutter size. Further testing is necessary to formulate the relationships between the factors affecting cutting performance, and to correlate laboratory and field data. Extensive laboratory tests will be conducted on factors affecting cutting performance, including cutter edge angle, cutter size, depth of cut, cutter wear, and multi-kerf cutters. Also tested will be cutter pattern, spacing, thrust, torque and speed of cutting. The results of these tests will be combined with field boring data to develop the scaling relationships. In addition, a theory will be developed with the verification from experimental data to describe the effect and interrelationship of factors which affect cutting performance. This research will result in a practical means of predicting tunnel boring performance and will provide characteristic performance relationships valuable for machine design and field tunneling operations.

PERFORMING AGENCY: Colorado School of Mines, Department of Mining Engineering

INVESTIGATOR: Wang, F

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-07776 A03

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Feb. 1976 TOTAL FUNDS: \$73,300

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1467)

00 134841

**RESEARCH INITIATION-ANALYSIS OF GROUND VIBRATIONS PRODUCED BY PILE DRIVING**

In this research a program of field vibration measurements is to be undertaken to study the influence of pile type, hammer type and operating characteristics, driving resistance, depth of pile penetration, and pile attitude on the types and intensities of ground vibrations produced in a known soil system. Variations in vertical, transverse, and horizontal displacements and/or accelerations will be measured at several distances from the point of penetration of the piles. Pile types include reinforced concrete displacement piles and steel H-piles. Field measurement will be used to establish or verify correlations between the parameters listed vibration intensities. The field data will also be made available for use in a more comprehensive analytical and/or laboratory program aimed at the establishment of predictive relationships between dynamic soil properties and energy input from pile driving.

PERFORMING AGENCY: Georgia Institute of Technology, School of Civil Engineering

INVESTIGATOR: Hardcastle, JH

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG75-10276

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1975 TOTAL FUNDS: \$17,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5194)

00 134940

**SUBGRADE STABILITY**

The general objectives of the study are to: 1) determine required levels of subgrade stability; and 2) to develop recommendations and procedures for more adequately considering subgrade stability during the project design state, establishing improved quality control and specifications for subgrade and embankment construction, and correcting subgrade stability problems. Current activity is directed toward identifying the major factors that influence subgrade stability.

PERFORMING AGENCY: Illinois University, Urbana, Department of Civil Engineering

INVESTIGATOR: Thompson, MR (Tel (217)333-3930) Figueroa, JL

Kinney, TC Traylor, ML

SPONSORING AGENCY: Illinois Department of Transportation, IHR-605

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$85,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (YIL 676), Illinois University, Urbana

00 135095

**PHOTOELASTIC STUDY OF BLASTING PROCEDURES IN URBAN AREAS**

The objective of the program is to improve hard rock blasting procedures to effect cost reductions in urban projects and to improve the safety of the blasting process. The general research approach involves the use of scale models to examine the phenomena of stress wave propagation, crack initiation, crack propagation and the fragmentation process. Scale models of full-planes, half-planes, half-spaces and bench faces will be examined in the laboratory where advanced optical methods are employed to make the various dynamical processes visible over the entire field of the model. Excellent progress during the first year was made in the application of dynamic photoelasticity and holographic interferometry to problems related to surface excavation and tunneling. Dynamic surface motion in rock models caused by explosives will continue to be studied utilizing holography. A detailed design will be made of three charge holders which were demonstrated to be advantageous (during the first year of study) for presplitting and smooth blasting. Dynamic photoelasticity will be employed to examine stress wave propagation and fracture extension and fragmentation in producing tunnel sections.

PERFORMING AGENCY: Maryland University, College Park, Department of Mechanical Engineering

INVESTIGATOR: Dally, JW

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-07908 A01

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 TOTAL FUNDS: \$79,950

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 639 1)

00 135249

**EVALUATION OF REMOTE SENSING APPLIED TO CIVIL WORKS PROJECTS**

The objective is to determine the feasibility of assessing civil works sites by measuring soil moisture using remote sensing in the 0.4 to 14 microns wavelength region. The approach was to perform investigations to determine the conditions under which soil moisture can be correlated with remotely sensed reflected energy (0.4 to 2.5 microns) and emitted energy (8 to 14 microns). Apply these results to civil works sites to evaluate their usefulness to field conditions. Applications to be studied include: landslides, levees, highways, ground water localities and dams. Application studies will be cooperative efforts with USACE and California State agencies.

PERFORMING AGENCY: Ames Research Center, National Aeronautics and Space Administration

INVESTIGATOR: Chapman, DR

SPONSORING AGENCY: Ames Research Center, Aeronautics and Space Technology Office, NASA, 177-53-13 7570511

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZH 41637)

00 135290

**STRESS-STRAIN BEHAVIOR OF COHESIONLESS SOIL DURING UNLOADING AND RELOADING**

The objectives of this research are: (1) To study the stress-strain characteristics of cohesionless soil during unloading and reloading using conventional triaxial tests, plane strain tests, triaxial tests with independent control of all three principal stresses on cubical specimens, and simple shear tests in which the principal axes of stress can be rotated. (2) To evaluate the procedures used for characterization of soil stress-strain behavior during unloading and reloading, and alternatively to develop improved procedures for this characterization.



PERFORMING AGENCY: California University, Los Angeles, Department of Mechanics and Structures  
 INVESTIGATOR: Lade, PV  
 SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG75-05325

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1975 TOTAL FUNDS: \$27,600

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5511)

00 135296

**THERMOCORER FOR RAPID TUNNELING AND EXCAVATION**  
 The feasibility of using a dynamic rock melting method to increase advance rates will be determined. Static melting rates are limited by the relatively thick layer of molten material between the penetrator and the rock. Theoretical calculations show that circulating the molten material has the potential of reducing the thickness of the lava layer, thus permitting much greater advance rates. The fluid dynamic performance of a dynamic melter (Thermocorer) will first be optimized by analysis and experiment. To avoid the use of refractory metals in the penetrator, the feasibility will be found by melting glass which has a lower melting temperature than rocks) dynamically and comparing the advance rates to that using static melting procedures. A preliminary cost/benefit study will be made for the Thermocorer.

PERFORMING AGENCY: Energy Research and Generation, Incorporated  
 INVESTIGATOR: Benson, GM  
 SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-03322 A02

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 TOTAL FUNDS: \$40,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1022 2)

00 135514

**RAPID ASSESSMENT OF ROCK MASS CONDITIONS**  
 To develop a technique for the rapid assessment of the integrity of rock slopes, tunnel rock, dam abutments, and embankments. Thermal anomalies associated with known structural defects will be studied and their significance with respect to the behavior of the structure determined. Anomalies investigated will include loose tunnel rock, voids behind shotcrete and/or concrete structures, and leakage through dam abutments or embankments.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers  
 INVESTIGATOR: Huie, JS  
 SPONSORING AGENCY: Waterways Experiment Station, Army Corps of Engineers, DAOM8183

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA138183)

00 135516

**RAPID EXCAVATION WITH EXPLOSIVES-EXPLOSIVE EXCAVATION IN DIFFERING GEOLOGIC MEDIA AND TOPOGRAPHY**  
 Purpose of study/investigation: To develop improved techniques of excavation with explosives for civil engineering projects that lead to cost stabilization or reduction. This program provides salary and travel funds for planning, executing and reporting field experiments at Corps project sites.

PERFORMING AGENCY: Department of the Army, Explosive Excavation Research Laboratory  
 INVESTIGATOR: Mills, RR  
 SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 356)

00 135518

**RAPID EXCAVATION WITH EXPLOSIVES; CHARGE SHAPE, EMPLACEMENT PATTERNS AND FIRING TECHNIQUES**  
 Purpose of study/investigation: To develop controlled Project Lost Creek and the measurements made to get a large structural excavations where some cost advantage would result from the use of larger charges.

PERFORMING AGENCY: Department of the Army, Explosive Excavation Research Laboratory  
 INVESTIGATOR: Mills, RR  
 SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 358)

00 135550

**RATIONAL DESIGN OF TUNNEL SUPPORTS**  
 OBJECTIVE: To develop reliable design procedures and to encourage the adoption of improved construction techniques for tunnel support systems that satisfy structural and economic requirements. APPROACH: Various analytical solutions applicable to tunnels constructed by the Corps and other agencies will be documented and/or developed and checked for performance adequacy. The check will be accomplished by the review of instrumentation data from selected projects and follow-through construction and performance appraisal. Corrections will be made to the theoretical analysis for the purpose of arriving at reliable design approaches and construction procedures for tunnel support systems.

PERFORMING AGENCY: Department of the Army, Missouri River Engineering Division  
 INVESTIGATOR: Redlinger, JF Underwood, LB  
 SPONSORING AGENCY: Army Corps of Engineers, Department of the Army, 31214

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 529 2)

00 136026

**RUNOFF SIMULATION**  
 Few long-term runoff records exist for small drainage basins. The need for long-term records for small basins is great. The records are used in the design of highway crossings, in urban planning, and in water-resource development. The development of computer simulation models, such as rainfall-runoff relations and multivariate generating processes, will provide means for synthesizing long-term runoff records. Some of these models will permit simulation of basin response to varying environmental conditions. The emphasis will be to study and develop, as feasibility and needs dictate, runoff simulation models to provide synthetic data for specific applications such as flood investigations, urban storm runoff, and mean monthly flows. The emphasis has been to synthesize flood peaks for rural drainage basins. Future work will encompass more complex models to synthesize urban storm runoff, daily discharge in rural basins, and combining subbasin runoff to estimate basin outflow. In areas where rainfall-runoff relations are impracticable, models such as multivariate generating processes will be developed. Operational versions of runoff simulation models will be programmed for a variety of environmental conditions. Criteria for selection and delineation of input data for models will be developed. Methods of climate-record transposition will be investigated. Limitations in the application of each model will be explored. Approaches to the synthesis of large basin runoff through distributed routing of synthesized small basin records will be initiated. Multivariate generating processes will also be utilized to synthesize runoff. Synthetic flood frequency data derived by rainfall-runoff modeling and continued evaluation of information content of rainfall-runoff model output (long-term synthetic flood frequency statistics). Develop "optimum" model calibration procedures (computer programs) in relation to the worth of synthetic data.

PERFORMING AGENCY: Geological Survey, Water Resources Division  
 SPONSORING AGENCY: Geological Survey, Water Resources Division, NR 70-069

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973 TOTAL FUNDS: \$52,500

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZUA 2685 1)

00 136152

**THE U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY**

The U.S. National Committee on Tunneling Technology was established in 1972, at the request of the Chairman of the Federal Council for Science and Technology, to assess the broad range of activities and related technologies pertaining to the use of subsurface space and to stimulate improvements in underground construction technology. Improvements are needed to meet increasing national demands for providing life-support functions in urban areas and recovery of resources (mining and drilling) with minimum environmental impact. The Committee is pursuing a number of programs to stimulate improvements related to creation and use of subsurface space in the following areas: (1) Education of engineers, officials, and the public, (2) Assessment of environmental and energy impact of the use of subsurface space, (3) Encouragement of improved practices for underground construction contracting, (4) Evaluation of technology and recommendations for research, (5) Evaluation of systems for collection and dissemination of geological and engineering data required for planning and completing underground construction. The Committee also participates in the activities of the International Tunneling Association (ITA) on behalf of the scientists, engineers, and technologists of the United States. The ITA was formed in 1974, and seven cooperative projects are underway on subjects including planning use of the subsurface, research needs, and standardization.

PERFORMING AGENCY: National Academy of Sciences

INVESTIGATOR: Israelsen, OA

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR 74-02378-A09 C310-277-009

Contract

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Dec. 1978 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 803 2)

00 136165

**US COMMITTEE FOR ROCK MECHANICS**

The aims of the project are to review new developments and trends in rock mechanics; research, implement and enhance exchange of technical information among scientists; identify and encourage research activities that will advance rock mechanics technology; and coordinate international efforts in rock mechanics research. The proposed program and activities of the Committee for Rock Mechanics are consistent with the responsibilities of U.S. Army Corps of Engineers and Office, Chief of Research and Development to keep abreast of new developments and to direct army research toward most promising areas pertinent to army requirements in rapid excavation, drilling, construction and prediction of engineering properties of rock mass. The approach will involve identification of research needs, dissemination of published information on rock mechanics through abstracting service and translations, preparation of advisory reports, coordination and participation in domestic and international professional societies, conferences and symposia, and periodic reviews and surveys of national research efforts in rock mechanics and related fields.

PERFORMING AGENCY: National Academy of Sciences

INVESTIGATOR: Israelsen, OA

SPONSORING AGENCY: Bureau of Mines

Contract

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: Dec. 1978

ACKNOWLEDGMENT: Science Information Exchange (GQA 19654 4)

00 138468

**ECONOMIC FACTORS IN TUNNEL CONSTRUCTION**

Analysis of tunnel case histories as an aid in formulation of a tunnel cost data base, and development of systems analysis methodologies related to tunnel cost estimations.

PERFORMING AGENCY: Bechtel Corporation

INVESTIGATOR: Gin, E

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Sluz, A (Tel (617) 494-2432)

Contract DOT-TSC-1104

STATUS: Active NOTICE DATE: July 1976 START DATE: Jan. 1976 COMPLETION DATE: Jan. 1977

ACKNOWLEDGMENT: TSC

00 138477

**EVALUATION OF REPAIR TECHNIQUES FOR DAMAGED STEEL BRIDGE MEMBERS**

The first phase of this project will identify and categorize common types of accidental damage to steel bridges and the frequencies of their occurrence; analyze the state of the art of present practice and equipment used for assessing damage and repairing highway and railroad bridges and other steel structures (including heating temperatures, jacking methods, straightening tolerance and degradation of steel's mechanical properties and service life); evaluate techniques that have been applied or may be applied for correcting structural damage; preparation of report of Phase I and outline Phase II research.

PERFORMING AGENCY: Battelle Columbus Laboratories, NCHRP 12-17

INVESTIGATOR: Mishler, HW (Tel (614)424-7378)

SPONSORING AGENCY: American Assn of State Hwy and Transp Officials; Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Reilly, RJ (Tel (202) 389-6741)

Contract HR-12-17

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1976 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$50,000

ACKNOWLEDGMENT: National Cooperative Highway Research Program

00 138478

**SCANNED ACOUSTICAL HOLOGRAPHY FOR GEOLOGIC PREDICTION**

One of the costly aspects of underground excavation is the uncertainty of the ground conditions ahead of the tunnel face and how it will react when "opened". Prediction of poor rock, water, faulting, etc., is needed to prevent costly delays. Rapid tunneling techniques increase the need for accurate prediction. A multi-phased project for producing a means of "seeing" into the rock using Scanned Acoustical Holography has been initiated. The final objective of the project is to install an Acoustical Holography inspection system on a rapid tunneling machine in such a manner that "real-time" presentation of the observed geologic and rock conditions 30 to 100 feet ahead of the machine is made available to the machine operator in a simple, usable format, without delaying the tunneling operation. Phase I, the preliminary demonstration of the feasibility of using scanned acoustical holography on a rock model has produced successful results. In Phase II the project moves from a small-scale laboratory model through intermediate steps to a full-scale system and finally the use of Acoustical Holography will be demonstrated on an actual tunnel heading.

PERFORMING AGENCY: Holosonics, Incorporated

INVESTIGATOR: Price, TO

SPONSORING AGENCY: National Science Foundation, APR 73-03200 A01

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 TOTAL FUNDS: \$423,500

ACKNOWLEDGMENT: National Science Foundation (GSQ 1279)

00 138502

**IMPROVING UNDERGROUND EXCAVATION THROUGH THE APPLICATION OF HYDRAULIC WATER JET ASSISTED MECHANICAL TUNNEL BORING**

A full scale hydraulic water jet assisted tunnel boring machine will be designed and field tested with the support of laboratory experiment and testing. The objective of this investigation is to verify the concept and laboratory projection of increasing the rate of underground excavation several fold through the application of high pressure hydraulic water jets to assist the conventional mechanical method of tunneling. The project consists of (1) the design and fabrication of the full scale equipment, and, the complete prototype water jet assisted tunnel boring machine, (2) field testing

of the prototype system, (3) laboratory equipment and testing to guide and assist the full scale design and field test, and (4) engineering analysis and economic evaluation of the hydraulic mechanical method of excavation. This research will further tunneling technology through the design and testing of a full scale machine to provide engineering and cost-performance data for improving rate of excavation, the reduction of cutter and labor costs and thus, the overall tunneling cost.

See RRIS 00A 138502 for a report.

PERFORMING AGENCY: Colorado School of Mines  
 INVESTIGATOR: Wang, F  
 SPONSORING AGENCY: National Science Foundation

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1975 TOTAL FUNDS: \$257,200

ACKNOWLEDGMENT: National Science Foundation

#### 00 138532 TUNNELING

To use underground space as an effective means of meeting the increasing needs of urban transportation systems, this program seeks to improve the social, economic and environmental impacts of tunneling processes, reduce costs of construction, improve tunnel design and maintenance procedures, and alter materials handling and utilization procedures. In the DOT Transportation Tunneling Program, UMTA is the lead administration in the following categories: Interactions with society, maintenance modal problems and materials handling.

PERFORMING AGENCY: Transportation Systems Center, Department of Transportation; Transit Development Corporation, Incorporated  
 SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Butler, GL

Contract UM-604

STATUS: Active NOTICE DATE: July 1976 START DATE: 1970 COMPLETION DATE: 1981 TOTAL FUNDS: \$30,000,000

ACKNOWLEDGMENT: UMTA

#### 00 139166 EMBANKMENT SUPPORT FOR A RAILROAD TEST TRACK

After participation in the design and construction of the embankment for the Kansas Test Track in 1970 and 1971, the static and dynamic data yielded by instrumentation was to be compiled, analyzed and interpreted. Interpretations of the embankment failure mechanisms have been made and instrumentation proved somewhat inadequate to accommodate the permanent settlements that occurred and to adequately measure moisture.

Report, Embankment Support for a Railroad Test Track, being prepared for publication.

PERFORMING AGENCY: Shannon and Wilson, Incorporated  
 INVESTIGATOR: Dietrick, RJ (Tel (415) 697-7503) Salley, JR  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel (202) 426-4377)

Contract DOT-FR-54168

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Dec. 1976

ACKNOWLEDGMENT: FRA

#### 00 139169 ENGINEERING AND GEOPHYSICAL STUDIES OF KANSAS TEST TRACK

During the design, construction and operation of the Kansas Test Track, vibroseismic tests were performed to determine elastic properties of the subgrade. After the premature failure of KTT, the objective is to determine the failure mechanisms, appraise validity of built-in instrumentation's data and perform static and dynamic response investigations of unconventional track structures for validating analytical models of such construction. This includes nondestructive testing, other field testing and laboratory testing.

#### REFERENCES:

Vibroseismic Survey, Railway Test Embankment, Aikman, Kansas Curro, JR, Jr, WES Mis. Paper S-72-36

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers

INVESTIGATOR: Ballard, RF (Tel (601) 636-3111)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel (202) 426-4377)

Contract DOT-AR-30025

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1972 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

#### 00 141171 MECHANICAL FRAGMENTATION OF ROCK FOR RAPID TUNNELING

The original research was initiated to determine techniques of combining thermal and mechanical methods of excavating hard rock, primarily for tunneling. It was found that for practical application heat energy develops stress fields slowly, and consequently requires excessive time for fracture. Also, when two or more mechanical splitters were used simultaneously fracturing was caused more quickly and was more easily controlled. By adding an impact hammer to the splitter system the speed of the splitting action was increased by a factor of three to five. Investigations to date have indicated that rock excavation of tunnel faces with splitters complemented by an impact hammer is technically and economically feasible. Research will be conducted in the following areas to provide the foundation for a practical excavation system: (1) investigation of metallurgical problems to provide longer life wedges and feathers; (2) research to improve the performance of the hydraulic system; (3) research on the parameters of the impact element (hammer); (4) laboratory research with a Darda type testing machine; (5) field tests to verify lab results and to improve round design; (6) theoretical studies of fracture processes to be verified by field tests; and (7) excavation system analysis and cost studies.

PERFORMING AGENCY: Missouri University, Rolla, Graduate School, Mining Engineering

INVESTIGATOR: Clark, GB

SPONSORING AGENCY: National Science Foundation, Advanced Product Research and Technology Div, APR73-07846-A02

STATUS: Active NOTICE DATE: June 1976 START DATE: Mar. 1976 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$189,500

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1513)

#### 00 141172 COMPARATIVE COSTS OF TUNNELS WITH DEPTH OF CONSTRUCTION IN URBAN AREAS

This research will include a study of the relative costs of tunnels as a function of construction depth in a number of major U.S. urban areas. Such tunnels may be used for urban and intercity highways, railroads, urban mass transportation, utilities (utiladors), sewage and storm water runoff, etc. Construction cost estimates that incorporate the effects of local conditions such as soil and rock characteristics, and of systematic factors such as inflation and construction technology will be prepared. The results will be useful to planners, engineers, and government officials who require meaningful construction cost estimates to properly evaluate alternative tunnel location strategies. The research team consists of an interdisciplinary team made up of engineers and geologists who will (1) evaluate local soil and rock conditions in key urban areas (2) use existing tunnel computer cost models to compare alternative underground placement strategies for tunnels and (3) generalize findings into key criteria to guide decisions for the best placement of underground systems.

PERFORMING AGENCY: Illinois University, Chicago, Department of Materials Engineering

INVESTIGATOR: Silver, ML

SPONSORING AGENCY: National Science Foundation, Advanced Product Research and Technology Div, APR76-00315

STATUS: Active NOTICE DATE: June 1976 START DATE: May 1976 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$135,200

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1558)

00 147737

**VULNERABILITY OF TRANSPORTATION & WATER SYSTEMS TO SEISMIC HAZARDS**

Lifeline engineering is the evaluation of the dependency of urban regions on their service systems. The essential features of lifelines are their geographical extent and their redundancies, or lack thereof. The lifeline's geographic spread extends the area within which seismic damage may cause failure of an urban system; for the urban region involved, this is a magnification of seismic risk. Lifeline models will be developed which will permit the preparation of inverse iso-seismal maps for given lifelines; zones within which a shock of given magnitude will cause lifeline failure. The (integrated) value of earthquake frequency over the areas contained within the inverse iso-seismals (or the "damage areas") is a direct measure of seismic risk. The problem is particularly significant for areas in the east-central part of the United States. The lifeline models and earthquake risk calculations will be generated and performed for select major east-central cities. The techniques will be presented in a manner facilitating their use by other analysts. The results of the analyses of the selected cities will serve to illustrate the increased seismic risk encountered in a lifeline analysis (as opposed to an in-situ structural analysis) and the further increased relative risk for east-central areas.

PERFORMING AGENCY: Carnegie-Mellon University, School of Fine Arts, Architecture

INVESTIGATOR: Oppenheim, I

SPONSORING AGENCY: National Science Foundation, Division of Advanced Environmental Research & Technology, ENV75-20977

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: June 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$93,500

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1582)

00 147742

**AN EVALUATION OF R & D PRIORITIES IN SUBSURFACE INVESTIGATION**

The objective of the research is the development of a model for calculation of the benefits to be derived from research and development in subsurface investigation for tunnel construction. The model will be based on historical data from water, sewer, and transportation tunnels, and on information about improved tunnel construction technologies. A small number of tunnels will be chosen based on the requirements that (1) they had cost overruns associated with insufficient subsurface information; and (2) they are representative of a larger sample of tunnels having similar problems. Historical cost overruns will be computed by comparing the cost of construction if complete subsurface information had been known with actual costs. These data will be analyzed to compare costs if detailed, accurate information on geological conditions and if the technology to capitalize on the information had been available. Finally, estimates will be made of federally financed tunnel construction during the coming decade to estimate the cost savings expected based on the application of better information and improved technology. These estimates will be compared with projected R & D expenditures by the Federal government.

PERFORMING AGENCY: Underground Technical Development Corporation

INVESTIGATOR: Foster, EL

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR76-06185

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: June 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$149,500

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1576)

00 148317

**IMPROVED DESIGN PROCEDURE FOR TUNNEL SUPPORTS**

The proposed research intends to improve the present design procedure for tunnel supports. Toward this end, the research will: 1) Introduce a support design which takes ground-structure interaction into account, and which is based on the concept of optimization. 2) Develop analytical design techniques that simulate the ground-structure interaction in a rational manner and are flexible enough to permit the inclusion of improved knowledge as it becomes available. The New Austrian Tunneling Method (NATM) will be studied in detail, with particular emphasis on obstacles that were overcome with its implementation in Europe. NATM is an observational technique where detailed load deformations are constantly monitored and the appropriate design changes are made. The possibility of instituting observational techniques in the United States will be investigated in detail.

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Einstein, HH

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: McFarland, RK

Contract DOT-OS-60136

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$70,000

ACKNOWLEDGMENT: DOT

00 148333

**FIELD RESEARCH EXPERIMENT FOR EVALUATION OF GEOLOGIC STRUCTURE AND ENGINEERING PROPERTIES OF GROUND USING NEW SITE EXPLORATION TECHNIQUES**

Boreholes available for new site exploration techniques such as: low-frequency Surface Profiling Radar; Borehole Radar; a Pulsed Acoustic System; and the use of advanced Data Processing Techniques.

PERFORMING AGENCY: Federal Highway Administration, Structure and Applied Mechanics Division, 703/321-9000

SPONSORING AGENCY: Washington Metropolitan Area Transit Authority

RESPONSIBLE INDIVIDUAL: Garrett, VK, Jr (Tel (202)637-1138)

STATUS: Proposed NOTICE DATE: Feb. 1977 COMPLETION DATE: July 1977 TOTAL FUNDS: \$25,000

ACKNOWLEDGMENT: Washington Metropolitan Area Transit Authority

01 038973

**RAILROAD TRACK STRUCTURES RESEARCH**

The Federal Railroad Administration (FRA) and the Association of American Railroads (AAR), the contractor, enter into a program to perform specific Railroad Track Structures Research. The program is expected to encompass a number of tasks for research into a variety of technical factors affecting railroad track and related systems and subsystems. The Railroad Track Structures Research Program consists of Four Tasks: Mathematical Modeling, Ballast and Subgrade Material Performance Tests, Rolling Load Facility Tests and Track Research Laboratory Facility. Work continues only on Ballast and Subgrade Material Performance Tests and on the Rolling Load Facility Tests.

## REFERENCES:

- Technical Data Base Report (task 2) July 1975, PB-251771
- Functional Requirements for a Facility for Accelerated Service testing (task 4), Sept. 1976
- Structural Model and Materials Evaluation Procedures (task 2), Sept. 1976
- Track Support Systems Parameter Study (task 2) Sept. 1976
- Finite Element Analysis of a Railway Track Support System - User's Manual (task 2), Sept. 1976

PERFORMING AGENCY: Association of American Railroads; Illinois University, Urbana, Department of Civil Engineering  
 INVESTIGATOR: Martin, GC (Tel (312) 567-3588) Thompson, MR (Tel (217) 333-3930)

SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel (202)426-4377)

Contract DOT-FR-30038  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1973 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: FRA

01 038974

**CONTINUOUS MEASUREMENT OF DYNAMIC COMPLIANCE CHARACTERISTICS OF RAILROAD TRACK. PHASE 3**

The contract is for the design, fabrication, demonstration and furnishing of equipment for the continuous measurement of dynamic compliance characteristics of railroad track.

## REFERENCES:

- A Review of Measurement Techniques, Requirements and Available Data on the Dynamic Compliance of Railroad Track, Kaiser, WD, May 1975, PB-250547/AS

PERFORMING AGENCY: Battelle Memorial Institute  
 INVESTIGATOR: Prause, RH (Tel 614-2993151)  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: O'Sullivan, WB

Contract DOT-FR-30051  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1973 COMPLETION DATE: 1979

ACKNOWLEDGMENT: TRAIS (PR# RP-39)

01 058306

**STATE-OF-THE-ART SURVEY: RAIL JOINING METHODS**

Research and review existing, as well as potential, rail joining methods with the aim of weighing the strengths and weaknesses of each. Also areas are to be identified where further research and development efforts could lead to cost and/or performance improvements in joining rails.

Research for this project was also performed by Metals and Ceramics Information Center of the Defense Supply Agency.

PERFORMING AGENCY: Department of Defense, Defense Supply Agency; Battelle Columbus Laboratories, Metals and Ceramics Information Center  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Steele, RK (Tel (617) 494-2002)

STATUS: Completed NOTICE DATE: Feb. 1977 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$56,390

ACKNOWLEDGMENT: FRA

01 058307

**RAIL INSPECTION SYSTEMS ANALYSIS AND TECHNOLOGY SURVEY**

The objective of the program is to define quantitatively those factors which limit the present speeds of inspection systems and to determine the overall costs associated with making improvements in rail flaw inspection systems which would provide increased speeds, decreased inspection costs, increased inspection reliability, and/or increased sensitivity. To determine these factors, studies of three railroads are being made to quantify track and operating characteristics; studies are being made to determine operating speeds; studies are being made to define transducer performance/cost tradeoffs; studies are being made of data acquisition and processing systems and costs are being determined for several combinations of systems and operation conditions.

Reports are available through NTIS. Work was performed under contract to: Electromechanical Branch, DOT; Transportation Systems Center.

## REFERENCES:

- Rail Inspection Systems Analysis and Technology Survey. Interim Report, Meacham, HC, Dec. 1975
- Rail Inspection Systems Analysis and Technology Survey. Phase I, Final Report, Kaiser, WD, 7605

PERFORMING AGENCY: Battelle Columbus Laboratories  
 INVESTIGATOR: Kaiser, WD (Tel (614)424-6424) Ensminger, D Meacham, HC Flora, J Byers, R Becker, L Posakony, G  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Ceccon, H (Tel (612)494-2711)

Contract DOT-TSC-979  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1975 TOTAL FUNDS: \$163,370

ACKNOWLEDGMENT: FRA

01 058352

**NONDESTRUCTIVE MEASUREMENT OF LONGITUDINAL RAIL STRESSES**

One objective is to study the effect of applied stress on the propagation of ultrasonic pulses in high carbon, railroad-quality rail steel. This will be accomplished by an analysis of appropriate wave equations with the non-linear elastic constants included plus experimental work to compare with the predicted results. The second objective will be to initiate research utilizing ultrasonic pulses that will result in techniques adoptable to the in-situ measurement of longitudinal stresses in rail via a test car moving at standard operating speeds. Measurement of these stresses will enable operating railroads to locate highly stressed areas in rail.

PERFORMING AGENCY: Oklahoma University, Aerospace, Mechanical and Nuclear Engineering Dept  
 INVESTIGATOR: Engle, DM  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: O'Sullivan, WB (Tel 202-426-4377)

Contract DOT-OS-40091  
 STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: 1974 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$113,000

ACKNOWLEDGMENT: TRAIS, FRA

01 058458

**FABRICATE, TEST, EVALUATE, AND DELIVER AN ULTRASONIC WHEEL PROBE INSPECTION SYSTEM**

Objectives are: 1. To provide ultrasonic wheel probes for an ultrasonic inspection system which can detect all potentially dangerous defects. Particular emphasis shall be given to the detection of vertical split heads and the inspection of welded joints in continuously welded rail. The capabilities of these components will improve the detectability of ultrasonic inspection and also provide additional defect information needed to facilitate automatic data processing. 2. To test and evaluate the ultrasonic system in the field by comparing the inspection results with that of a magnetic inspection system.

PERFORMING AGENCY: DAPCO Industries, Incorporated  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, RR-519  
 RESPONSIBLE INDIVIDUAL: Ceccon, H (Tel 617-494-2711)

Contract DOT-TSC-995

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 TOTAL FUNDS: \$75,552

ACKNOWLEDGMENT: TRAIS (RR-519)

01 058644

**RAIL FLAW OCCURRENCE SURVEY**

Objectives are: 1. Develop the data base from a review of available failure records from which statistical evaluations can be made. 2. Develop and apply statistical procedures which will determine interrelationships of rail failure and train derailment occurrence. 3. Calculate severity indices for difference types of rail defects as causes of train derailments from this analysis of the data base. 4. Ascertain, for defects of important severity, the relationships between flaw occurrence, load environment and characteristics of track locations, construction, maintenance, and inspection. 5. Propose one or more approaches for the reliability analysis of rail-in-service utilizing the information generated.

PERFORMING AGENCY: Midwest Research Institute  
SPONSORING AGENCY: Transportation Systems Center, RR-519  
RESPONSIBLE INDIVIDUAL: Karlin, A (Tel (617)494-2092)

Contract DOT-TSC-1061 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$64,195

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

01 058671

**DEVELOPMENT OF ULTRASONIC IMAGING SYSTEM FOR HIGH SPEED RAIL INSPECTION**

An ultrasonic scanning system shall be built, employing dual non-directional transducers, and utilizing both direct and boundary reflected signals which will record data in a form compatible with synthetic aperture image processing. Direct display of untransformed data recordings will permit definitive assessment of the validity of the new transducer configurations in the unique geometry peculiar to rail inspection, and will provide an immediate capability for inspection of welds and other transverse plane defects. A further short-term payoff will be provided through adaptation of the data recording and display equipment to produce an improved consolidated B-scan display for conventional assemblies of directional transducers.

PERFORMING AGENCY: Electra-Physics Laboratories, Incorporated  
SPONSORING AGENCY: Transportation Systems Center, RR-519

Contract DOT-TSC-1036 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: June 1975 COMPLETION DATE: Apr. 1976 TOTAL FUNDS: \$96,577

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

01 058673

**SLEEVE EXPANSION OF BOLT HOLES IN RAILROAD RAIL**

Objectives are: 1. To ascertain by laboratory testing that the sleeve expansion process is likely to be an effective means of reducing the bolt hole failure rate under railroad loading conditions. 2. Having accomplished this, to devise and implement a test plan for a preliminary field evaluation defining costs and time required to implement the plan.

PERFORMING AGENCY: Boeing Commercial Airplane Company  
SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development, RR-519  
RESPONSIBLE INDIVIDUAL: Steele, RK (Tel (617)494-2002)

Contract DOT-TSC-1048

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$238,681

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

01 058698

**INSTRUMENTATION AND DATA PROCESSING EQUIPMENT ON RAIL VEHICLES FOR MEASURING TRACK GEOMETRY AND RAIL FLAW**

Tasks include: 1. Refurbish a rail hospital car for track inspection applications. 2. Install a vehicle track geometry measurement system and

install rail flaw detection instrumentation. 3. Furnish and install an on-board digital computer system for system control, data recording and data processing. 4. Develop and implement the necessary computer programs for performing on-board track geometry defect analysis and rail flaw analysis. 5. Survey the market for availability of a high railer-type motor vehicle and track geometry instrumentation for the purpose of providing unloaded measurements. 6. Carry out validation and acceptance testing of the completed track inspection vehicle. 7. Conduct a training program for operation and maintenance personnel.

PERFORMING AGENCY: ENSCO, Incorporated  
SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
RESPONSIBLE INDIVIDUAL: Mould, J (Tel (202)426-1682)

Contract FR-54190 (CPFF)

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: June 1975 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$1,300,000

ACKNOWLEDGMENT: TRAIS

01 058728

**ANALYSIS AND DESIGN REQUIREMENTS FOR IMPROVED CROSS TIE TRACK SYSTEMS**

The emphasis is on applying existing data, analyses, and instrumentation to a characterization of the response and deterioration of track structures under typical wheel/rail loads. In addition, studies of the influence of tie/fastener characteristics on track performance and the adequacy of 'synthetic' tie fastener assemblies for mainline application under typical North American loadings will be coupled with an economic study to investigate the feasibility of 'synthetic' cross ties for U.S. usage.

PERFORMING AGENCY: Battelle Memorial Institute  
SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, RR-519  
RESPONSIBLE INDIVIDUAL: Kish, A (Tel (617)-494-2442)

Contract DOT-TSC-1044

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$423,461

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

01 081797

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 1--TRACK STRUCTURES**

Task objectives are development of recommended performance specifications and maintenance and geometric design guidelines for conventional railroad track and related track structures and components. This activity is intended to quantify the adequacy of a guideway that yields an acceptable level of ride quality and safety with minimization of first cost, maintenance costs, and secondary costs such as loss and damage, and wear and fatigue to vehicles. Task will recognize that load environment is a function of track parameters, wheel load, and level of maintenance. The Track Structures Dynamic Test Facility, developed under separate AAR/FRA contract, has the capability of determining the basic structures as affected by different subgrade materials, different types of ballast, various types of ties, spacing and rail sizes. A moving load allows for compaction of ballast subgrade material. Also sensitivity studies of track parameters, including basic alignment of the structure with such factors as minimum length of tangent between curves and deviation from theoretical line and surface, have been made using computer modeling techniques developed in Phase I.

PERFORMING AGENCY: Association of American Railroads Technical Center  
INVESTIGATOR: Martin, GC (Tel 312-225-9600 Ext 877)  
SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency  
RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Jan. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: AAR

01 099366

**TECHNOECONOMIC SURVEY OF METHODS FOR REFURNISHMENT OF WOOD CROSS TIES**

The contractor will conduct a review of cross tie deterioration mechanisms and a survey of the number and severity of ties exhibiting such deterioration. He then will critically assess the technical and economic capability of existing polymeric or other processes of refurbishing ties either in-situ, on-site or in batch plant operation. Processing requirements will be determined and techniques for fulfilling these requirements identified. Based on this, the feasibility of such processes, both technical and economic, will be determined. Specific recommendations for research and/or development will be identified.

PERFORMING AGENCY: Stanford Research Institute

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

RESPONSIBLE INDIVIDUAL: McConnell, DP (Tel (617)494-2451)

Contract DOT-TSC-1044

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$53,000

ACKNOWLEDGMENT: FRA

01 099369

**OPERATION OF TEST TRACK AND RAIL INSPECTION EQUIPMENT**

Because of the interdependence between each of the newly developed components for track and rail inspection, a critical test and evaluation must be carried out on each to assess its contribution to the total system. From the results of the tests and evaluations, an assessment of the developments can provide the information needed to generate work statements for future developments. In order to facilitate an effective test and evaluation, qualified technical personnel and testing facilities are required. The facilities primarily consist of an NDT laboratory, two test tracks, and a rail inspection vehicle. The NDT laboratory contains the instrumentation needed to perform the commonly used NDT techniques. The test tracks contain machined and natural rail defects on which inspection equipment can be tested up to speeds of 40 mph. The rail inspection vehicle is a hi-rail vehicle and currently uses ultrasonics exclusively to perform the rail inspection. The hi-rail vehicle provides the mobility required for a test vehicle and has ample space to house newly developed equipment. The staff presently consists of two technicians and two engineers.

PERFORMING AGENCY: Transportation Systems Center

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

RESPONSIBLE INDIVIDUAL: Ceccon, H (Tel 617-494-2711)

In-House

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1974

ACKNOWLEDGMENT: FRA

01 099378

**IMPROVED INSPECTION, DETECTION AND TESTING RESEARCH**

The objectives of this program are to provide engineering and field test support services to FRA-sponsored programs and to develop additional track inspection vehicles for the Office of Safety. In the process of collecting data for Amtrak, the Northeast Corridor Project and the Office of Safety, as well as for other FRA R&D programs, 145 tests on some 15 different railroads covered approximately 43,000 miles of track. The track geometry measurement system previously developed can now be utilized to detect safety-related defects. To provide the Office of Safety with two track inspection systems, an existing vehicle is being rebuilt and a new unit is being built.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Peterson, LA (Tel 202-426-2965)

STATUS: Active NOTICE DATE: Aug. 1976 TOTAL FUNDS: \$10,600,000

ACKNOWLEDGMENT: FRA

01 099393

**PROGRAM FOR INVESTIGATION OF RAIL FAILURES**

The objective of this program is to evaluate the metallurgical and applied stress environment coincident with failures in conventional carbon steel rail and in other types. The following steps are involved: (A) Characterize in the laboratory, service-developed defects resulting in field failures in carbon steel rails with emphasis on short service life or premature failures; (B) Determine in the laboratory the chemistry, metallography and mechanical properties of carbon steel rails in service; (C) Determine in the field the state of stress in carbon steel rails in service under a wide range of conditions track and loadings; (D) Establish possible interrelationships of material properties, service stresses and service failures; (E) Promote similar laboratory and service evaluations of economically attainable variations in rail steel and treatments, consistent with progress of work performed on carbon steel rail. Specimens supplied consist of 8-foot rail sections containing a detected defect. These specimens are used to determine the spectrum of properties which possibly may be associated with each type of defect. Selected in-track sites are instrumented to determine service stresses associated with fatigue crack initiation. Relation between service-initiated failures and attendant stress is correlated. Work with steels other than the conventional carbon type is to be undertaken.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; American Iron and Steel Institute; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Martin, GC (Tel 312-225-9600)

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: AAR

01 099394

**RAIL FLAW DETECTION SYSTEMS**

The detector car section of the AAR Technical Center has constantly worked on materials and systems for upgrading the privately-owned and operated rail detector cars using the residual magnetic method as developed and built by the AAR. Along with this, studies of advanced technologies of rail flaw detection, such as ultrasonics, have been conducted. An ultrasonic rail test system and recording equipment to meet FRA track inspection requirements was initially tested under one of the standard magnetic detector cars. The ultrasonic system significantly increased flaw detection due to its greater sensitivity in the web area. This was followed by construction of a new detector car equipped exclusively with ultrasonics which will be used in refining techniques using this rail flaw detection system.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Martin, GC (Tel 312-225-9600)

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: AAR

01 099396

**ACCOUSTICAL EMISSION MONITORING OF FIELD AND PLANT WELDS**

Accoustical emissions in the ultrasonic range can be monitored with appropriate equipment to determine the soundness of field and plant welds made in steel rails. The investigation has shown that good and bad welds can be detected by the procedure. Additional development is directed to the refinements necessary for a production installation.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Martin, GC (Tel 312-225-9600)

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: AAR



01 099415

**THE PROTECTION OF TRACK SWITCHES FROM SNOW AND ICE FAILURE**

Investigate methods of track switch protection from failure due to snow or ice. Thermal, non-thermal and passive methods have been and are being evaluated. A pulse jet combustion heater for forced convection heating in remote areas has been developed. A cyclone combustion heater has been developed for areas with adequate power supplies. A non-thermal switch protection system based on a horizontal air curtain has been evaluated on a limited scale for three winters. More extensive evaluation is planned. Two switches have been designed and fabricated. One employs vertical lift point members while the second uses a horizontal traverse double rail head profile section. Both switches need only overcome shear loads and do not have compression loading of snow or ice. One switch has had limited field trials while the second is due for field installation in mid-1975.

PERFORMING AGENCY: National Research Council of Canada, Division of Mechanical Engineering

INVESTIGATOR: Ringer, TR (Tel 613-993-2439)

SPONSORING AGENCY: National Research Council of Canada, Associate Committee on Railway Problems

STATUS: Active NOTICE DATE: Aug. 1975

ACKNOWLEDGMENT: National Research Council of Canada

01 109019

**DEFORMATIONS UNDER RAIL TRACK STRUCTURE AND SUPPORT**

The overall objective is the improvement of railway track support through better selection and use of ballast material and the sizing and spacing of rail ties. The objective implies the need to increase the resistance of the track structure to the development of irregularities due to repeated loading from traffic and due to the effects of weather. The program is primarily concerned with methods of selection and specification of ballast materials and optimization of the design of the ballasted track structure.

**REFERENCES:**

A Study of Stresses & Deformations under dynamic and Static Load Systems in Track Structure and Support, Raymond, GP, Canadian Institute of Guided Ground Transport, Report No. 75-10, Sept. 1975

Stresses and Deformations in Railway Track Raymond, GP; Lake, RW; Boon, CJ, CIGGT, Rpt. No. 76-11, Nov. 1976

PERFORMING AGENCY: Queen's University, Canada

INVESTIGATOR: Raymond, GP

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1971 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: CIGGT

01 131759

**FUNDAMENTAL PROBLEMS OF RAILROAD TRACK MECHANICS**

Four fundamental research problems in railroad track mechanics will be investigated. One project will consist of a basic study of foundation models which are needed for the inclusion in more sophisticated railroad track analyses with a view of establishing the suitability of these models for track analyses. The second project will deal with the determination of bending stresses in the rails caused by static and dynamic loads, assuming that the base responds like a Pasternak model. The obtained results will be compared with the available results for the Winkler model and relevant test data, in order to establish the accuracy of the more general formulation. The third project will study the effect of the various assumptions made in the published analyses, on the determined buckling temperatures, such as: the effect of different temperature increases in each rail, the effect of various assumptions for the lateral ballast resistance, and the effect of dropping the usual assumption that in the adjoining regions the track rests on a "rigid" base. The fourth project will study the effect of nonlinear base characteristics on the dynamic response of the track. Of particular interest is the effect of pre-loading of the track by a distributed load, since often dynamic measuring cars are located in the middle of a moving train and the clarification of this effect is necessary for the proper interpretation of the recorded results.

PERFORMING AGENCY: Princeton University, Department of Aeronautics and Astronautics

INVESTIGATOR: Kerr, AD

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG74-19030

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Feb. 1976 COMPLETION DATE: Jan. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5107)

01 138467

**MECHANICS OF BALLAST COMPACTION**

Formulation of ballast compaction guidelines based on a review of the theory on the compaction of ballast sized, non-cohesive materials, laboratory and field measurements. Measures of the degree of ballast compaction are being developed.

PERFORMING AGENCY: State University of New York, Buffalo

INVESTIGATOR: Selig, ET (Tel (716) 831-3113)

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Sluz, A (Tel (617) 494-2432)

Contract DOT-TSC-1115

STATUS: Active NOTICE DATE: July 1976 START DATE: Jan. 1976 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$216,000

ACKNOWLEDGMENT: TSC

01 138535

**TRACK GEOMETRY MEASUREMENT**

This project is to produce a real-time track geometry measurement system which includes on-line data processing capability and may be used at revenue speeds without requirement for a special vehicle.

PERFORMING AGENCY: Transportation Systems Center, Department of Transportation

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Spencer, PE (Tel (202) 426-0090)

Contract UM-504

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1974 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$1,600,000

ACKNOWLEDGMENT: UMTA

01 138560

**TRACK INSPECTION AND TESTING**

Develops, recommends, implements and promotes an improved inspection and detection project in support of the FRA National Track Inspection Program. Provides for support of test activities and data collection and coordinates support with the Office of Safety, other FRA elements, government agencies, railroads and support contractors. Makes provisions for operation, maintenance and transportation of inspection vehicles and for data processing services.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Winn, JB (Tel (202) 426-1682)

STATUS: Active NOTICE DATE: June 1976 START DATE: July 1975

ACKNOWLEDGMENT: FRA

01 138561

**AUTOMATED TRACK INSPECTION, SYSTEM DEVELOPMENT**

The objective of this program is to provide automated equipment to assist the FRA Track Inspectors in monitoring the National track network. A fleet of vehicles will be procured to measure track geometry and internal rail flaws. This fleet includes three existing measurement vehicles which provide real time data to both the inspector and the host railroad. Measurement systems will be developed and tested for potential use in the inspection vehicle.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Winn, JB (Tel (202) 426-1682)

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138562

##### IMPROVED TRACK STRUCTURES RESEARCH PROGRAM

The Improved Track Structures Research Program has been established to achieve improvements in the safety of train operations by reducing the frequency of train derailments through providing guidelines, standards and techniques for achieving safer track structures and to improve the serviceability of the track structures through more effective maintenance techniques and with more durable, yet economic track structure designs. The program will accomplish these objectives through a series of contract research efforts and research at the Transportation Systems Center addressing both analytical studies and field test verification.

For subprograms see RRIS Nos. 01A 138563 and 01A 138564. RRIS. Bulletin 7602.

PERFORMING AGENCY: Federal Railroad Administration, Improved Track Structures Research Division

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Krick, RL (Tel (202) 426-4377)

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138563

##### TRACK ACCIDENT REDUCTION RESEARCH SUBPROGRAM

The Track Accident Reduction Research Subprogram is directed toward improvement in the number and frequency of train accidents related to track structure causes by identification of operating limits for existing rolling stock running on contemporary track based on limiting adverse wheel/rail dynamic interaction and by specification of the safe structural load bearing limits of existing track systems and required inspection demands.

PERFORMING AGENCY: Federal Railroad Administration, Improved Track Structures Research Division

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Krick, RL (Tel (202) 426-4377)

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138564

##### IMPROVED TRACK PERFORMANCE RESEARCH SUBPROGRAM

The Improved Track Performance Research Subprogram is directed toward improvement in track stability and life by development of cost effective guidelines for upgrading current track systems, for designing affordable track system alternatives and for making cost effective maintenance decisions. The following technical areas are being considered: new rail quality, improved rail joining techniques, analysis and design for improved cross tie-track systems, ballast selection-material performance studies, soil stabilization studies, ballast tamping and consolidating equipment performance maximization and track maintenance studies.

PERFORMING AGENCY: Federal Railroad Administration, Improved Track Structures Research Division

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Krick, RL (Tel (202) 426-4377)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138568

##### COOPERATIVE RESEARCH PROGRAM ON TIMBER CROSS TIE DEVELOPMENT

A variety of particle board specimens involving variations in geometry, orientation and binding resins for the fibers have been investigated for the production of a reconstituted cross tie. The design with seven laminated particle boards with the external laminates featuring fiber orientation have been subjected to laboratory tests showing them having characteristics much like sawn hardwood ties. Production of several hundred ties for service testing and economic analysis of the feasibility of such a product are being made.

PERFORMING AGENCY: Forest Products Laboratory; Association of American Railroads Technical Center

SPONSORING AGENCY: Forest Products Laboratory; Association of American Railroads; Federal Railroad Administration

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1973

#### 01 138798

##### RAIL OVERTURNING INVESTIGATION

As part of task 1 of Phase II of the Track Train Dynamics Program, this study considers the factors which can contribute to the overturning of rail.

PERFORMING AGENCY: Illinois Institute of Technology, Civil Engineering Department

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: 1975 COMPLETION DATE: Dec. 1976

#### 01 139163

##### ENGINEERING ANALYSIS OF STRESS IN RAILS

This program is to analyze procedure for predicting stresses in rails; to provide a description of stresses required for prediction of rail degradation and rail failure due to fissures, split heads and bolt hole cracks; to assess design and operational trade-offs on thermal, flexural, residual and contact stresses and to provide input to a rail reliability model. The goal is an analytical model where factors in rail degradation may be determined.

PERFORMING AGENCY: Battelle Columbus Laboratories

INVESTIGATOR: Johns, TG (Tel (614)424-4569)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: McConnell, DP (Tel (617) 494-2451)

Contract DOT-TSC-1038

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: FRA

#### 01 139165

##### COLLECTION AND ANALYSIS OF TEST DATA

Because of the premature failure of the Kansas Test Track, the contractor is to complete analysis of available data and to conduct a post mortem study of the instrumentation originally installed in concrete cross tie/and concrete slab track. Premature termination of traffic meant that all of the data sought will not be obtained. Remaining instruments are to be examined for condition and environment with the aim of determining if the data that was obtained was valid. Reports describing track performance using the available data will be completed.

PERFORMING AGENCY: Portland Cement Association

INVESTIGATOR: Colley, BE (Tel (312)966-6200) Hanson, NW

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel (202)426-4377)

Contract DOT-TSC-FR-90043

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: FRA

**01 139167**

## **MEASUREMENT OF VERTICAL TRACK STIFFNESS**

The objective is to demonstrate the feasibility of stiffness measurement using the Kansas Test Track and the FRA track measurement cars equipped with existing track surface measurement systems and then develop and demonstrate software to support real-time measurement of stiffness using Southern Railway's Track Measurement Car R-1. Soft spots may be determined before they develop into serious geometric defects and it can be found if an existing geometric defect is related to track stiffness.

PERFORMING AGENCY: ENSCO, Incorporated  
INVESTIGATOR: Corbin, J (Tel (703) 321-9000)  
SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
RESPONSIBLE INDIVIDUAL: O'Sullivan, WB (Tel (202) 426-4377)

Contract DOT-FR-54174

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1975 COMPLETION DATE: Mar. 1977

ACKNOWLEDGMENT: FRA

**01 139168**

## **DYNAMIC ANALYSIS OF NONCONVENTIONAL TRACK STRUCTURE AT KANSAS TEST TRACK**

After premature failure of the Kansas Test Track, the objective is to determine reasons for observed large deflections of concrete beam and slab track structures, particularly at control joints. The mechanism for negative bending moment cracks on tops of beams and slabs is to be investigated. The effect of major system parameters on track structures responses is to be studied. Mathematical models will study dynamic characteristics of the

track with extension to models of the nonconventional track sections as a basis for design improvements of beam/slab structures.

PERFORMING AGENCY: MITRE Corporation  
INVESTIGATOR: Milner, JL (Tel (703) 790-6456)  
SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel (202) 426-4377)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Jan. 1977

ACKNOWLEDGMENT: FRA

**01 148355**

## **ROAD MAINTENANCE COST MODEL**

The purpose is the development of a road maintenance cost model which uses the physical rates of deterioration of individual track components to superimpose cost sensitivity to a wider range of relevant variables than is possible using existing accounting records. The study will intergrate variability in maintenance requirements implied by previous technical research into the cost frame work for m/w, supplementing these with traffic density-related cost penalties. The integrated model is intended to be applied to the problem of estimating route and service specific unit costs.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
INVESTIGATOR: Roney, MD Lake, RW  
SPONSORING AGENCY: Canadian National Railways

STATUS: Active NOTICE DATE: Feb. 1977 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

02 055835

**ENGINEERING DATA ON RAIL SYSTEM DYNAMICS**

The efforts of the contractor are expected to result in: 1- A computer program to be operational on TSC equipment for predicting the forces and tracking errors of a slowly moving rail car negotiating curves and traveling over track with specified track irregularities and alignment variations. 2 -Analytical tools and computations subroutines for extension of linearized model response programs existing at TSC for predicting rail vehicle vibration and track forces in response to statistical and deterministic descriptions of track geometry and track irregularities to include the influence of significant rail system non-linearities. 3- definition of Test Requirements for validation of the analysis tools developed above for prediction of rail system dynamics.

PERFORMING AGENCY: Clemson University, Department of Mechanical Engineering

INVESTIGATOR: Law, EH Cooperider, NK Hedrick, JK

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Weinstock, H (Tel (617)494-2038)

Contract DOT-TSC-902

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1974 TOTAL FUNDS: \$95,000

ACKNOWLEDGMENT: FRA

02 058257

**TRACK-TRAIN DYNAMICS RESEARCH PROGRAM, PHASE II**

In a joint international Government-industry program, the Federal Railroad Administration in cooperation with the Association of American Railroads, the Railway Progress Institute, and the Canadian Transportation Development Agency has undertaken a ten-year comprehensive Track-Train Dynamics Research Program to develop a better understanding of the kinematics of railroad performance. This joint research effort is divided into three phases, the first of which has entailed the collection and analysis of data that is necessary to define quantitatively the characteristics of the present railroad system in North America. In the second phase (3 years) this data is to be applied to the development of requirements and interim performance specifications that will lead eventually to the development of improved equipment in the third (5 years) phase of the program. Initially in Phase II investigations will be conducted in the following areas: track structures, wheel-rail contact, trucks and suspension, carbody, couplers and draft gear and the brake system. The descriptive data in this research listing pertains only to that portion of the overall program that is sponsored by the Federal Railroad Administration. This support amounts to approximately one-third of the total resources dedicated to the TTD Research Program.

PERFORMING AGENCY: Association of American Railroads

INVESTIGATOR: Sutliff, DR (Tel 312-225-9600)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, D (Tel (202)426-1227)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1976 COMPLETION DATE: July 1979 TOTAL FUNDS: \$1,900,000

ACKNOWLEDGMENT: FRA

02 058263

**ROLL DYNAMICS UNIT/VIBRATION TEST UNIT FOR U.S. DEPARTMENT OF TRANSPORTATION RAIL DYNAMICS LABORATORY**

The U.S. Department of Transportation Rail Dynamics Laboratory (RDL) will house the Roll Dynamics Unit (RDU) and Vibration Test Unit (VTU) at the Transportation Test Center, Pueblo, Colorado. The RDL will permit analytical and experimental studies of railroad and transit vehicles, systems, and components in a controlled, reproducible lab environment with minimal risk to equipment and personnel. Through the study of vehicle dynamics in the RDL, the number of dynamic related accidents and derailments and their attendant costs should be reduced significantly. The contractor is responsible to deliver a functional RDU and VTU. The RDU will be capable of simulating speeds of approximately 200 mph and will accommodate vehicles up to 108 feet long, 12 feet, weighing 200 tons. The VTU will subject rail equipment to vertical and lateral vibrations experienced on typical track and handle vehicles up to 90 feet long, 12 feet wide and weighing 160 tons.

PERFORMING AGENCY: Wyle Laboratories, Scientific Services and Systems Group

INVESTIGATOR: de Benedet, D (Tel 303-597-4500)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Gross, A (Tel (202)755-1877)

Contract DOT-FR-64200

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$7,000,000

ACKNOWLEDGMENT: FRA

02 058265

**RAILROAD EQUIPMENT RIDE QUALITY ANALYSIS**

This project will determine ride quality characteristics of various designs of railroad equipment trucks by means of computer simulation. Report under preparation.

PERFORMING AGENCY: Battelle Memorial Institute

INVESTIGATOR: Meekum, H (Tel 614-299-3151)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Gannett, CM (Tel 202-426-9655)

Contract DOT-FR-20077

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: Jan. 1975 TOTAL FUNDS: \$45,000

ACKNOWLEDGMENT: FRA

02 058401

**AERODYNAMICS ON SUBWAY TUNNEL DESIGN AND OPERATIONAL COSTS**

Objectives are: (1) Define key design parameters that relate to aerodynamics and determine the operational costs of the design options. (2) Determine the operational costs associated with the operational design options, i.e., train length and scheduling. (3) Assess the impact of environmental constraints on operational costs and related to the aerodynamics of the system.

PERFORMING AGENCY: National Aeronautics and Space Administration

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: McFarland, RK (Tel 202-4269638)

IA DOT-AS-50030

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Feb. 1975 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$23,600

ACKNOWLEDGMENT: TRAIS

02 058465

**WAYSIDE AND ON-BOARD DERAILMENT INSPECTION REQUIREMENTS STUDY**

The main objective is to establish the impact and causes of railroad derailments and derailment-related accidents, and to assess existing and possible new wayside and on-board inspection means for preventing or reducing the occurrence of these events. It is also the objective to produce an analysis and presentation of derailments and pertinent related, matters organized in a manner to facilitate understanding, identification of common characteristics and ultimately, effective methods of correction. Finally, the effort seeks to establish a posture on future action with respect to wayside and on-board detection and prevention of derailments: what changes and improvements should be made, and what innovations can best effect improvement with respect to wayside and on-board detection and prevention of accidents.

PERFORMING AGENCY: Shaker Research Corporation

INVESTIGATOR: Frarey, JL

SPONSORING AGENCY: Transportation Systems Center, RR-523

RESPONSIBLE INDIVIDUAL: Ehrehbeck, R (Tel (617)494-2273)

Contract DOT-TSC-1029 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$77,114

ACKNOWLEDGMENT: TRAIS (RR-523), FRA

02 058508

**GUIDEWAY VEHICLE COST REDUCTION**

In the first year of this project, vehicle and guideway models have been developed, cost data assembled, and active suspension feasibility studied. Research ongoing in the current year involves cost/performance tradeoff studies for the various suspension and guideway alternatives, continued development of advanced suspension concepts, and a study of active guidance feasibility. STATUS: Progress has been made in the following area: an extensive review of the theory and applications of active suspension systems has been completed. In preparing a summary of such systems, several aspects of active control were considered: suspension system models, disturbance models, techniques of system optimization, ride quality, effects of feedback control, and existing and proposed applications. Both pneumatic and hydraulic active suspension systems are currently being analyzed in terms of technical and economic feasibility. Existing railcar and bus suspension system models have been evaluated, and computer simulations of the most suitable models have been developed. Transit system cost data has been obtained and is currently being analyzed to identify operation and maintenance costs. A preliminary cost function has been estimated for these data, and an initial suspension/guideway maintenance cost tradeoff has been performed.

## REFERENCES:

A review of Bus and Passenger Railcar Dynamical Models White, RC, Jr, Arizona State University, Dec. 1975  
 Guideway Vehicle Cost Reduction Klinger, DL, Final Report, July 1976

PERFORMING AGENCY: Arizona State University, Tempe, Department of Mechanical Engineering

INVESTIGATOR: Klinger, DL (Tel (602)965-6469)

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation; Arizona State University, Tempe

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202)426-9365)

Contract DOT-OS-50107 (CS)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$128,000

ACKNOWLEDGMENT: TRAIS (PUR-50175), OST

02 081796

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II**

The objectives of this program are the development of recommended performance specifications and design guidelines for railroad freight cars, track structures, and their components and subsystems. Performance specifications are to coincide with the demands of the dynamic operating environment to which such systems are subjected. Details of methods and scope are included under specific task references.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Sutliff, DR (Tel 312-225-9600 X-1463) Hawthorne, KL (Tel 312-255-9600 X-1463) Martin, GC (Tel 312-225-9600 X-1463)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: July 1976 START DATE: Jan. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: AAR

02 081799

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 2--WHEEL/RAIL**

Overall task goals are to improve knowledge of the mechanics of wheel/rail interactions and to establish recommended performance specifications and design guidelines for wheels and rail. Task will involve applied research in wheel and rail metallurgy in order to determine requirements for improved performance. Research will also be conducted in stress analysis and fracture mechanics with the goal of developing improved design techniques and life cycle prediction methods. Stress analysis will especially concentrate on the contact stresses at the wheel/rail interface. Wear research conducted under Task 9, Advanced Analytical Techniques, will supply important input to

this task. Rail corrugation, with initial effort by Canadian participants in TTD, has been studied. The rail stress analysis investigation, with particular effort on determining the stresses within rails as developed by passage of a vehicle, is progressing. In the wheel area, present effort is on developing an elastic-plastic stress analysis because mechanical and thermal stresses can go beyond the yield point of steel.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR:

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Jan. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: AAR

02 081803

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 7--TEST MANAGEMENT**

Task objectives is to coordinate and conduct such tests as are necessary for the pursuit of Tasks 1-6 of Track Train Dynamics, Phase II. Task will provide clearinghouse function for data requests and will design and conduct appropriate laboratory and field tests.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Darien, H (Tel (312)225-9600 X-888)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Jan. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: AAR

02 081804

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 9--ADVANCED ANALYTICAL TECHNIQUES**

Task objective is to assure that Track Train Dynamics-Phase II, Tasks 1-6 are equipped with the latest advances in applicable analytical techniques. Task will essentially be performed through contract efforts in such areas as stress analysis, fracture mechanics, and wear properties of ferrous materials.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Martin, GC (Tel 312-225-9600 Ext 877) Moyar, GJ (Tel 312-225-9600 Ext 877)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Jan. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: AAR

02 081805

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 8--PROGRAM ANALYSIS**

The objective of this task is to assure economic justification of recommendations which result from research activities conducted in Tasks 1-6 of Phase II of the Track Train Dynamics Program. Task will include prior evaluation of research and implementation strategies to forecast potential economic benefits as an aid to priority determination. Areas selected for priority determination will be selected by program management. The principal technique for priority determination will be lifecycle costing based on data accumulated through existing industry channels supplemented by field

surveys. Task will supply economic justification package for final recommendations based on industry status and forecasts and time of release.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL (Tel 312-225-9600 Ext 862)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency

RESPONSIBLE INDIVIDUAL:

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Jan. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: AAR

02 099367

**PILOT STUDY FOR THE CHARACTERIZATION AND REDUCTION OF WHEEL/RAIL LOADS**

This project will be carried out in two phases, with the first phase developing a method for the analytic and experimental characterization of wheel/rail loads. In addition, this phase will provide a detailed program plan and a W/R load field measurement and data reduction plan for a specified track route that will then be implemented in Phase II. During Phase II, the W/R loads on selected track sections will be determined through implementation of the field measurement plan. These loads will be compared with those predicted through application of the analytical methodology. After modification and/or validation, the prediction method will be used to extrapolate W/R load data to alternative track, vehicle and operating conditions. This is intended to identify alternate strategies for reducing those W/R loads which are most closely associated with track degradation.

PERFORMING AGENCY: Battelle Memorial Institute

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

RESPONSIBLE INDIVIDUAL: Kurzweil, L (Tel 617-494-2142)

Contract DOT-TSC-1051

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$325,430

ACKNOWLEDGMENT: FRA

02 099380

**IMPROVED WHEEL AND RAIL PERFORMANCE CONTROL ON CONTACT STRESS**

A wheel-rail system should provide adequate traction and sufficient lateral guidance to prevent excessive flange contact and unstable dynamic modes of excess vibration and derailments. A general numerical method for analyzing contact stresses at conformal interfaces will be developed for conventional and new wheels and rails. Braking and acceleration will be considered in detail with the objective of greater safety. STATUS: Advanced numerical methods were developed to predict the stresses for conformal contact of bodies with symmetry. Techniques for analyzing the high stress occurring in multiply-connected contact regions (for example, when a wheel rolls over a spalled track) were also produced. Both of these methods have been validated through checks against known experimental results for the actual physical elements. In building the numerical techniques, a survey of the many applications of contact stress theory of railway engineering was conducted, and the results subsequently distributed.

REFERENCES:

Contact Stresses for Multiply-Connected Regions-The Case of Pitted Spheres, Paul, B; Singh, KP; Woodward, WS, Mech of Contact Between Deformable Bodies, Symp, Neth., pp 264-281

A Review of Rail-Wheel Contact Stress Problems Paul, B, Symp on Railroad Track Mech, Proc, Apr. 1975

Contact Stresses for Closely Conforming Bodies - Application to Cylinders and Spheres, Woodward, W; Paul, B, Feb. 1975

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of Mechanical Engineering and Applied Mechanics

INVESTIGATOR: Paul, B

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Gannett, CM

Contract DOT-OS-40093

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$69,745

ACKNOWLEDGMENT: DOT

02 099388

**FREIGHT LOSS AND DAMAGE PROGRAM**

This program is based on the evaluation of cost-effective means of damage control and a study of commodities to which various cost effective methods are applicable. It is planned to develop an industry approach to damage control by establishing coordinated programs to demonstrate and evaluate control procedures. The program will be directed toward the control of damage to lading and the economics of such control. Adequate background data is necessary to clearly define any damage problem. It is necessary in certain cases to define the fragility of the product and design laboratory tests to simulate the train environment and produce the same type of damage experienced in transit. Some areas of experimental research provide data on over-the-road shock and vibration and distribution of forces and accelerations in loaded cars under end impact conditions. In cooperation with the Railroad Truck Safety Research and Test Project, the environment during over-the-road operation of a 60-foot box car was determined by extensive instrumentation and recording equipment. This test covered a distance of 5,000 miles over five different railroads. The data, recorded on 22-3600 foot magnetic tapes in analog form was later digitized and sampled in a mini-computer and printed out in a teletypewriter. The data was sampled at the rate of ten times per second or 36,000 times per hour. It describes vertical, floor and roof lateral acceleration occurrences at both ends of the car and speed occurrences. The data is presented in RMS (root-mean-square) format. Statistical computer programs have been written to provide addition analyses such as combining data on a hour by hour basis. Data on freight car vibration will serve as input to the Rail Dynamics Simulator at the Transportation Test Center at Pueblo, Colo. At the request of the National Freight Loss and Damage Prevention Committee, and working with the Transportation Committee of the U.S. Brewers Association, a program was undertaken to understand and alleviate the damage to beer in aluminum cans. This is a pilot program in the can damage area. AAR has also provided funds to the Illinois Institute of Technology for research on freight damage with objectives of establishing analytical methods of predicting vibration and shock and then to design cost-effective methods for control. A report covering the first year of the two year program has been published.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: AAR

02 099390

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS. PHASE II. TASK 10--SPECIAL PROJECT, LOCOMOTIVES**

The objective of this task is to review accident statistics relating to derailments due to, or related to, locomotives for the purpose of determining whether or not six-axle locomotives are more prone to derailment than four-axle locomotives. Should the data reveal correlation between truck types and accidents, existing and/or newly developed computer models of locomotive trucks will be utilized for developing strategies for alleviating the problems.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL (Tel 312-225-9600 X-862) Polk, E

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: AAR

02 099408

**TRAIN/TRACK DYNAMICS PROGRAM. PHASE II**

This is the second phase of a jointly sponsored program of theoretical and experimental research on train/track dynamics and related areas. The

specific objectives of this phase of the work are: (a) Investigation of track wear including the effects of wheel and axle loadings, rail metallurgy and tribology. (b) Investigation of truck steering characteristics and methods of measurement of wheelset angle of attack. (c) Investigation of the applicability of laser equipment to the measure of vibrational and other characteristics of railway facilities including bridge structures.

PERFORMING AGENCY: Canadian Pacific  
 INVESTIGATOR: Bethune, AE (Tel 514-861-6811)  
 SPONSORING AGENCY: Canadian Pacific; Transportation Development Agency  
 RESPONSIBLE INDIVIDUAL: McLaren, W (Tel 514-2834536)

STATUS: Active NOTICE DATE: July 1976 START DATE: Mar. 1975 COMPLETION DATE: Feb. 1977

ACKNOWLEDGMENT: Transportation Development Agency

#### 02 099409

##### TRAIN/TRACK DYNAMICS PROGRAM, PHASE II

The program is the second phase of a broad research and development program in Train/Track Dynamics and related subjects. Specific objectives of the second phase are: (a) Measurement of freight car truck ride characteristics and evaluation of overall truck performance. (b) Evaluation of curving performance of trucks of six-axle locomotives with lateral clearance. (c) Evaluation of track structures including concrete ties with conventional fasteners and design of improved track structures including improved rail metallurgy. (d) Instrumentation of wheel sets to measure wheel/rail forces. (e) Research on wheel/rail interaction during curve negotiation including the effects of wheel profile to reduce severe wheel and track wear in curves. (f) Development of train handling recorder for use in the development of simulators for engineman training. (g) Evaluation of operational ballast requirements. (h) Evaluation of the effectiveness of various rail tie-down systems.

PERFORMING AGENCY: Canadian National Railways  
 INVESTIGATOR: Rennie, RP (Tel 514-877-4337)  
 SPONSORING AGENCY: Canadian National Railways; Transportation Development Agency  
 RESPONSIBLE INDIVIDUAL: McLaren, W (Tel 514-2834536)

STATUS: Active NOTICE DATE: July 1976 START DATE: Sept. 1974 COMPLETION DATE: Sept. 1976

ACKNOWLEDGMENT: Transportation Development Agency

#### 02 099431

##### RAILROAD TANK CAR SAFETY AND TEST PROJECT. PHASE 15- SWITCH YARD IMPACT TESTS

In 1972 and 1974 catastrophic switchyard accidents involved the striking of light empty freight cars by several heavy tank cars carrying liquefied flammable gas. The resulting head puncture of the leading loaded tank car by the coupler of the empty car released gas which flooded the yard without instant ignition. When the gas cloud finally reached a point of ignition, violent explosion ensued. Because of these accidents, a fullscale test program, supplemented by analytical studies was undertaken. In the tests single empty freight cars will be impacted by loaded tank cars, up to, and beyond, destructive speeds. The objectives are to assess the efficiency of the shelf coupler, the head shield, or both in combination, toward preventing punctures in this particular accident scenario. Analytical studies will be conducted to broaden the understanding of the phenomenon, particularly regarding the ranges of variables not easily studied in the tests alone. The program is being conducted in cooperation with the FRA at the DOT Transportation Test Center. This program has recently been completed. Results have indicated the effectiveness of head shields and shelf couplers which are expected to become a mandatory part of the DOT specifications for tank cars.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center  
 SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute  
 RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1974

ACKNOWLEDGMENT: AAR

#### 02 099434

##### DEVELOPMENT OF A TRAIN HANDLING CONTROL MODEL FOR FREIGHT TRAIN LOCOMOTIVE ENGINEER PERFORMANCE

The objective of this effort is to reduce data taken in locomotive cabs on revenue freight runs to the form of a mathematical model of the train handling performance of a locomotive engineer. As a minimum, the following phases of freight train handling will be modeled: starting the train from rest, controlling the train through changes in grade, and stopping the train. The data records include settings of locomotive controls, speed, accelerations, motor load, brake system pressures, wheel slip, drawbar force, slack condition, drawbar angle, and main generator voltage. Also available are supervisor ratings of each engineer's performance on each recorded test run. The development of this model is expected to contribute to the understanding and improvement of selection, training, and evaluation of engineers and to support the development of improved locomotive operating controls and displays.

Funds for this project are administered by DOT/Transportation Systems Center, Cambridge, Mass.

PERFORMING AGENCY: Turpin Systems Company  
 INVESTIGATOR: Birdsall, JB (Tel 213-998-1404)  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Ofsevit, D (Tel (617)494-2617)

Contract DOT-TSC-1037

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975 TOTAL FUNDS: \$37,204

ACKNOWLEDGMENT: FRA

#### 02 128041

##### CALCULATION OF TRAIN AERODYNAMIC DRAG (FOR ENERGY MANAGEMENT PROGRAM)

The purpose of this project is to: 1. Calculate the steady and unsteady aerodynamic drag of vehicles in tunnels and free air. 2. Modify and/or develop computer programs for the calculation of the aerodynamic drag of vehicles as required by the energy management program. A literature survey and review of the aerodynamics of trains in tunnels under project 3603 is well underway. Also, a computer program has been acquired to estimate the unsteady aerodynamic drag of vehicles in tunnels. With this program, it is now possible to start to perform the drag calculations for the purpose of obtaining preliminary power profile and energy loss estimates. It is anticipated that the program will have to be modified to incorporate the latest information obtained in the literature review. This project covers the calculation of aerodynamic drag for the three cases of deep tunnel, cut and cover, and free air, and studies on propulsion systems with and without energy storage. The result, conceptual designs on a total energy basis. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communic, Can, 3605  
 INVESTIGATOR: Colavincenzo, O  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communic, Can

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

#### 02 138469

##### TRUCK DESIGN OPTIMIZATION PROJECT, PHASE II

Phase II of the Truck Design Optimization Project (TDOP) will finalize the performance and testing specifications and economic methodology generated in Phase I; characterize the performance and economics of Type II, special service freight car trucks; develop performance and testing specifications as well as the economic methodology for Type II trucks incorporating wear and performance indices; provide related economic and analytical models of freight car trucks; and determine the feasibility of advanced designs and integrated carbody support systems.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Fay, GR (Tel (202) 426-0855)



STATUS: Proposed NOTICE DATE: July 1976 START DATE: Jan. 1977 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: FRA

02 138566

#### LOCOMOTIVE TRUCK DYNAMICS

The purpose of this study is to establish the dynamic performance criteria of locomotive trucks. NASA will obtain experimental parameters, such as stiffness and mass property data, in a format useable for direct application to various dynamic truck models being developed by industry and government.

PERFORMING AGENCY: Marshall Space Flight Center, National Aeronautics and Space Administration

INVESTIGATOR: Furman, J (Tel (205)453-2521)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Levine, D (Tel (202) 426-1227)

Contract DOT-AR-64231

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: FRA

02 138569

#### FREIGHT DAMAGE RESEARCH

The two-year project has resulted in a mathematical computer model for the dynamics of a box car with a load using 24 degrees of freedom for the car and 3 degrees for the freight element. Another computer model related to freight lading under end impact conditions involves a two-tiered appliance load subjected to hump and flat yard switching. The computer program has been written.

REFERENCES:

A Mathematical-Computer Simulation of the Dynamics of a Freight Environment in a Railroad Freight Car, Illinois Institute of Technology, Rpt. No. IIT-TRANS-72-2

PERFORMING AGENCY: Illinois Institute of Technology

SPONSORING AGENCY: Association of American Railroads Technical Center

STATUS: Active NOTICE DATE: July 1976 START DATE: 1974 COMPLETION DATE: 1976

02 138572

#### CAR RETARDER YARD PROJECT

This project envisions the development of a computer simulation of car retarder yards and the theoretical investigation into the friction mechanisms of retardation. An understanding of theoretical retardation mechanisms has developed and a small-scale replica of the retarding process will be used in development of appropriate friction coefficients for inclusion in the model and for validation and calibration of the model. The goal is a system for hump yards which will eliminate gross overspeed impacts during car coupling.

PERFORMING AGENCY: West Virginia University, Mechanical Engineering Department

SPONSORING AGENCY: Association of American Railroads

STATUS: Active NOTICE DATE: July 1976 START DATE: 1975

02 138799

#### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS. PHASE II. TASK II-IFAST COORDINATION

The Interim Facility for Accelerated Service Test (IFAST) has been established at the Transportation Test Center at Pueblo, Colo., and the AAR and industry have given a considerable amount of input and support to developing types of tests and assisting in acquisition of materials and equipment. This task provided coordination between FRA, TTC and industry personnel.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transportation Develop-

ment Agency

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: Oct. 1975 COMPLETION DATE: 1976

ACKNOWLEDGMENT: Association of American Railroads Technical Center

02 139171

#### VEHICLE/GUIDEWAY INTERACTIONS

Improved understanding of vehicle/guideway interactions can lead to improved guideway designs. Since guideway often represents the major portion of initial capital investment and subsequent maintenance for a transportation system, improved design based on sound theoretical and engineering analysis can lead to lower overall system costs. Results should be useful to system planners, public and private operators and construction contractors.

Contract not yet awarded.

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202) 426-9364)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1977

ACKNOWLEDGMENT: OST

02 139177

#### DYNAMIC PERFORMANCE CRITERIA FOR RAIL VEHICLE SAFETY

As part of an overall approach to assessment of track geometry standards and development of a core technology base for vehicle/track interaction, some work has been done on the effects of gage and cross level errors on dynamic performance. Efforts have been directed at derailment reduction dynamics with in-house work done on simplified wheelset models for defining influence of various factors on hunting instability. Algorithms and mathematical models of this phenomenon are being developed. Rock and roll stability has also been studied. The effect of track roughness on car dynamics is being studied.

PERFORMING AGENCY: Transportation Systems Center, Department of Transportation

INVESTIGATOR: Weinstock, H (Tel (617) 494-2038)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: O'Sullivan, WB (Tel (202) 426-4377)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975 COMPLETION DATE: 1977

ACKNOWLEDGMENT: FRA

02 139178

#### FACILITY FOR ACCELERATED SERVICE TESTING (FAST)

Accelerated life testing of track structures and certain components of rolling stock. A 4.8 mile loop of track, divided into 22 sections, with experiments on rail metallurgy, ties (hardwood, soft wood, concrete, steel), ballast (different materials, depths, shoulder width), etc. Four 2,000 HP locomotives pulling more than 80 cars (hoppers, tanks, flats) each grossing over 100 tons, at average speed of 42 MPH for a period not to exceed 16 hrs/day five day/week. Measurements taken during other 8 hours. Started operation in September 1976; approximately 30 million gross ton miles generated by January 1, 1977.

PERFORMING AGENCY: Federal Railroad Administration, Office of Research and Development

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Spanton, DL (Tel (202) 426-0850)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976

ACKNOWLEDGMENT: FRA

02 148322

#### APPLICATIONS OF DISTURBANCE ACCOMODATING CONTROL THEORY TO VEHICLE ACTIVE RIDE CONTROL PROBLEMS

"Active ride control" is an important aspect of high-speed transportation systems since irregularities of motion produce distress to occupants and

increased wear on the vehicle and/or guideway. Active ride control is achieved through the application of compensating forces in response to disturbances detected through the use of electronic sensing devices. The primary objective of the research is to explore the application of the theory of "disturbances accomodating controllers" (DAC) to the active ride control problem. A suitable mathematical model of a vehicle suspension system shall be chosen, and a DAC shall be designed as an active ride controller for the mathematical model. The DAC ride controller derived in this study shall be in mathematical equation form and will be compared to derived statistical types and other known forms of active ride controllers. The comparison will involve various aspects of the DAC's performance. Evaluations of DAC feasibility will result. As electronic information processing becomes progressively less expensive, it becomes worthwhile to investigate these techniques as an alternative to expensive structural solutions based in materials improvement.

PERFORMING AGENCY: Alabama University, Huntsville, Department of Electrical Engineering  
 INVESTIGATOR: Johnson, CD  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Mengert, PH

Contract DOT-OS-60126  
 STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$26,121

ACKNOWLEDGMENT: DOT

**02 148330  
 FUNDAMENTAL STUDIES OF PHENOMENA RELATED  
 WHEEL-RAIL CONTACT STRESSES**

The research will provide a better understanding of several important problems in railroad technology related to stresses in the wheel-rail contact area. These problems include wheel and rail fractures, excessive wear, wheel screech, and deteriorating ride quality. The research is a logical extension of work done. Contract DOT-OS-40093, (RRIS 02A 099380). Initial efforts will be directed toward improving the cost effectiveness of the numerical analysis methods developed under that contract. To optimally utilize these methods, it becomes necessary to fully understand the dynamics and physical behavior in the "contact patch" between rail wheel and track. Emphasis will be placed on developing mathematical approximations for both singly and doubly curved, elastic surfaces. Such surfaces provide an accurate model for the rail wheel "contact patch", and the techniques developed promise to be less costly than the more standard finite element method. The surface approximations, or influence curves will be computerized during a later phase of this research. It is anticipated that the methods developed in this research will be useful in the analysis of both new and worn wheel/track surfaces.

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of Mechanical Engineering and Applied Science  
 INVESTIGATOR: Paul, B  
 SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Gannett, CM

Contract DOT-OS-60144  
 STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$37,715

ACKNOWLEDGMENT: DOT

**02 148342  
 PROFILE MEASUREMENTS OF RAILS AND WHEELS**

Objective is the measurement of profiles of subway rails and wheels. This information will be translated into effective conicities for the system and used for vehicle dynamics studies.

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication, Can  
 INVESTIGATOR: Young, J (Tel (416)248-3771)  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communication, Can  
 RESPONSIBLE INDIVIDUAL: Jackson, J (Tel (416)248-3771)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$25,000

ACKNOWLEDGMENT: Ontario Ministry of Transportation & Communication, Can

**02 148358  
 EXPERIMENTAL RESEARCH ON RAIL VEHICLE SAFETY  
 USING DYNAMICALLY SCALED MODELS**

The objective of this research is to develop experimental techniques for the study of rail vehicle dynamics. Through the use of scaled models, a structural experimental data base on the characteristics of rail car trucks will be assembled. The establishment of this data base (more complete and systematically structured than that feasible from large scale testing) will enable the validation of analytical tools useful in the design of railroad components. Identifying the complex interactions between track, wheels, suspensions, and vehicles will help in understanding the causes of derailment, excessive wear, low operating speeds, and poor ride quality. The scale models will be used to establish the relationships between the wheel set displacement and the induced yawing motion in the suspension. Data will also be assembled on the tendency of rail wheels to "climb" the track under certain conditions. Existing theories, explaining these physical reactions will be re-evaluated in light of the experimental results.

PERFORMING AGENCY: Princeton University, Department of Aerospace and Mechanical Sciences  
 INVESTIGATOR: Sweet, LM  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Barrows, TM

Contract DOT-OS-60147  
 STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$69,308

ACKNOWLEDGMENT: TSC

03 025403

**URBAN RAPID RAIL VEHICLE SYSTEMS PROGRAM**

To enhance the attractiveness of rapid rail transportation to the urban traveler by providing existing and proposed transit systems with service that is comfortable, reliable, safe, and as economical as possible. Short range goals: Demonstration of the state-of-the-art in rapid rail vehicular technology. The Advanced Concept Train (ACT-1) phase calls for delivery of two next generation rail transit vehicles by early 1977 and the Advanced Subsystems Development Program (ASDP) calls for component development for near-term industry application.

Subcontractors for the project are St. Louis Car Company, AiResearch Manufacturing Company, Delco Electronics, Westinghouse Air Brake and the Budd Company.

PERFORMING AGENCY: Boeing Vertol Company  
 INVESTIGATOR: O'Brien, T (Tel 215-5223200)  
 SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Teel, SS (Tel 202-4260090)

Contract DOT-UT-10007

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1971 COMPLETION DATE: Dec. 1979 TOTAL FUNDS: \$45,700,000

ACKNOWLEDGMENT: UMTA (IT-06-0026)

03 036986

**ADVANCED DESIGN TECHNOLOGY FOR RAIL TRANSPORTATION VEHICLES**

Using the constraint method the program develops an analytical model for simulating the structural action of typical rail transportation vehicle components with sufficiently high degrees of precision to permit realistic evaluation of expected fatigue life. A computer program for analysis of peak stress values in stiffened plate and shell structures will be developed to facilitate the design and production of a safer, more economical transportation vehicle not using the trial-and-error method, to increase the knowledge and scope of the finite element method, and to better the flow of research information in the industry. The model will be able to evaluate alternative design decisions, incorporating advanced structural design techniques, on the basis of expected fatigue life for application in the railway car manufacturing industry. Expensive, time consuming physical experimentation will not be necessary. Detailed specifications for the development of an advanced finite element computer program is to be produced.

PERFORMING AGENCY: Washington University, St Louis  
 INVESTIGATOR: Szabo, B (Tel 314-8630104)  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Levine, D (Tel 202-4261227)

STATUS: Completed NOTICE DATE: Jan. 1977 START DATE: Apr. 1973 COMPLETION DATE: Mar. 1976 TOTAL FUNDS: \$87,600

ACKNOWLEDGMENT: TRAIS

03 045009

**STRUCTURAL STUDY OF HAZARDOUS MATERIAL TANK CARS**

The objectives of this research can be accomplished in three phases. The first phase shall be concerned with a review and evaluation of present specifications under which tank cars are currently being built. A study of the forces which tank cars are normally subjected to in service conditions will be part of this study. The next two phases are inter-related with one being an experimental study of a scale model one fourth or one fifth of a 112A 340W type tank car and the other being a theoretical analysis of a full scale tank car of the type 112A 340W using realistic thermal loads obtained from fire tests and analysis of fire accidents.

PERFORMING AGENCY: Louisiana Polytechnic Institute, Division of Engineering Research  
 INVESTIGATOR: Wilkinson, M  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Dancer, D (Tel (202)426-1227)

Contract DOT-FR-30056 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$149,000

ACKNOWLEDGMENT: FRA

03 046502

**RAILROAD WHEEL INVESTIGATION**

An analytical elastic solution to determine the stresses developed in a railway car wheel when subjected to axisymmetric heating is being used to evaluate different geometric designs. The theory is being extended to include inelastic analysis which should permit the determination of residual stresses developed in the wheel. Hot spots developed in the wheel tread by brake action are also being examined to assist in better modeling of the temperature profile for the theoretical analysis.

PERFORMING AGENCY: Illinois University, Urbana, Department of Theoretical and Applied Mechanics  
 INVESTIGATOR: Wetenkamp, HR Bhattacharyya, RK Kipp, RM  
 SPONSORING AGENCY: Griffin Wheel Company

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: July 1971

ACKNOWLEDGMENT: Science Information Exchange (JGF 25)

03 048945

**STUDY OF CRITERIA AND TECHNOLOGY FOR THE DESIGN OF SHELF COUPLERS**

The contractor shall develop, test, and validate a comprehensive mathematical model with two principal capabilities: 1. It shall be suitable for simulating train action during derailment situations that may result in tank head penetration by couplers. 2. The second model segment shall be designed to simulate the structural response of couplers to design loads.

PERFORMING AGENCY: Washington University, St Louis  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Doyle, J

Contract DOT-OS-40106

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: Mar. 1974 COMPLETION DATE: June 1976 TOTAL FUNDS: \$420,000

ACKNOWLEDGMENT: Office of Systems Development and Technology (PR # PUR-1-40191)

03 050338

**ARTICULATED RAIL CAR TRUCK DEVELOPMENT**

Develop a dramatically improved freight car truck. Obtain background information for applying basic design to (a) locomotives; (b) rapid-transit cars, and (c) passenger cars.

Design, build, and test 100 ton capacity freight car trucks based on earlier work with 1/8 size scale models and a continuing work with mathematical models (computer simulation). Design a method of retrofitting existing 3-piece freight car trucks to give radial-steering.

Testing to 80 mph under empty and loaded car with worn wheels indicates that basic design and principles are sound. Plans being made for further testing multiple trucks in service. Tests of the retrofitted 3-piece trucks indicate that the performance is nearly as good as for the earlier all-new "experimental" trucks. Dresser and Dofasco are now tooling up for testing of multiple car sets. AAR certification is being requested. Several U.S. railroads are also expressing interest in conducting service tests.

## REFERENCES:

An Evaluation of Recent Developments in Rail Car Truck Design, List, HA, ASME #71-RR-1, Apr. 1971, RRIS #050340-No 7401  
 Proposed Solutions to the Freight Car Truck Problems of Flange Wear and Truck Hunting, List, HA; Cardwell, WN; Marcotte, P, American Society of Mechanical Engineers, ASME #75-WA/RT-8, July 1975, RRIS #128632 in 7601

PERFORMING AGENCY: Railway Engineering Associates, Incorporated; Canadian National Railways; Dresser Transportation Equipment Division; Dominion Foundries and Steel, Limited  
 SPONSORING AGENCY: Railway Engineering Associates, Incorporated; Canadian National Railways; Dresser Transportation Equipment Division; Dominion Foundries and Steel, Limited  
 RESPONSIBLE INDIVIDUAL: List, HA Cope, GW Bexon, H

## In-House

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1971 COMPLETION DATE: 1977

ACKNOWLEDGMENT: Railway Engineering Associates, Incorporated, Dresser Transportation Equipment Division, Dominion Foundries and

Steel, Limited

**03 055604**

**A STRUCTURAL SURVEY OF CLASSES OF VEHICLES FOR CRASHWORTHINESS**

It is the purpose of this contract to provide the technical data required for the evaluation and improvement of the crashworthiness of several classes of rail vehicles as required in the rail safety effort. This contract is also to provide preliminary technical data for planning of possible future crashworthiness tests efforts.

PERFORMING AGENCY: Boeing Vertol Company  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Raab, AR (Tel (617)494-2539)

Contract DOT-TSC-856 (CPFF)  
 STATUS: Active NOTICE DATE: July 1976 START DATE: June 1974 COMPLETION DATE: June 1977 TOTAL FUNDS: \$239,139

ACKNOWLEDGMENT: UMTA, TRAIS

**03 055636**

**RAIL SAFETY/EQUIPMENT CRASHWORTHINESS**

The Transportation Systems Center (TSC) is providing technical assistance to the Federal Railroad Administration (FRA) in a program directed at improving railroad safety and efficiency by providing a technological basis for improvement and possible regulation in rail vehicle crashworthiness, inspection of equipment, surveillance of equipment, and other areas. As part of this program TSC is conducting technical analyses of passenger railcar collisions, derailments, and other accidents, directed toward minimizing occupant injuries.

PERFORMING AGENCY: Boeing Vertol Company  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Raab, AR (Tel (617)494-2539)

Contract DOT-TSC-821  
 STATUS: Active NOTICE DATE: July 1976 START DATE: June 1974 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$137,064

ACKNOWLEDGMENT: FRA

**03 055774**

**DEVELOPMENT OF DATA TO IMPROVE DESIGN CRITERIA OF RAILROAD WHEELS**

To measure the mechanical loads and thermal gradients due to tread braking on railroad wheels in actual service; to determine the major wheel stresses resulting from these loads and thermal effects; and to develop improved wheel service life criteria.

PERFORMING AGENCY: IIT Research Institute  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Steele, RK (Tel (617)494-2002)

Contract DOT-TSC-855 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$202,000

ACKNOWLEDGMENT: TSC (PR# TME-0120)

**03 055862**

**IMPROVEMENT OF RAILROAD ROLLER BEARING CERTIFICATION TEST PROCEDURES AND DEVELOPMENT OF ROLLER BEARING DIAGNOSTICS**

The problem of railroad roller bearing failure shall be reviewed giving consideration at a minimum to the effects of the following factors: 1. over and under lubrication. 2. loose bearing components (i.e. cap screws, seals, backing rings). 3. bearing component design. 4. adaptor condition. 5. rebuild procedures. 6. environment (speed, load, temperature). The interaction of factors leading sequentially to different modes of failure should be clearly established. An analytical model of the bearing may be useful in assessing the importance of interactions between these factors leading to bearing failure.

PERFORMING AGENCY: Shaker Research Corporation

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Steele, RK (Tel (617)494-2002)

Contract DOT-TSC-917 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1974 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$196,899

ACKNOWLEDGMENT: TRAIS (RR-414)

**03 055916**

**IMPROVEMENT OF RAILROAD ROLLER BEARING CERTIFICATION TEST PROCEDURES AND DEVELOPMENT OF ROLLER BEARING DIAGNOSTICS**

The problem of railroad roller bearing failure shall be reviewed giving consideration at a minimum to the effects of the following factors: 1. over and under lubrication. 2. loose bearing components (i.e. cap screws, seals, backing rings). 3. bearing component design. 4. adaptor condition. 5. rebuild procedures. 6. environment (speed, load, temperature). The interaction of factors leading sequentially to different modes of failure should be clearly established. An analytical model of the bearing may be useful in assessing the importance of interaction between these factors leading to bearing failure. Under a modification to the contract concepts for railroad roller bearing detection systems are to be evaluated. These systems are: 1. On-board Thermally Power Transmitter Bolt; 2. Pulse Echo Ultrasonic Lubrication Detector, and 3. Shock Pulse Damage Detector.

PERFORMING AGENCY: SKF Industries, Incorporated  
 INVESTIGATOR: Howard, PL, Jr (Tel (215)265-1900)  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, RR-523  
 RESPONSIBLE INDIVIDUAL: Yearwood, KW (Tel (617)494-2123)

Contract DOT-TSC-935 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1974 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$113,885

ACKNOWLEDGMENT: TRAIS (RR-523)

**03 058251**

**ASSESSMENT OF AUTOMATIC COUPLING SYSTEMS FOR RAILROAD FREIGHT CARS**

The objective of this activity is identification, classification, and analysis of all significant concepts in rail freight car coupling systems which offer, through more-nearly automatic operation, a potential for an improvement in safety and overall operational costs compared to present couplers. Tasks include a literature survey, definition of operational characteristics of relevant concepts, preliminary engineering analysis and feasibility study of promising systems, preliminary estimation of life-cycle costs, and preparation of a recommended development plan.

PERFORMING AGENCY: Kearney (AT) and Company, Incorporated  
 INVESTIGATOR: Nyquist, A (Tel (312)782-2868)  
 SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Hazel, M (Tel (617)494-2528)

Contract DOT-TSC-1087  
 STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: July 1976 TOTAL FUNDS: \$92,296

ACKNOWLEDGMENT: FRA

**03 058301**

**RESEARCH OF FREIGHT DAMAGE, WHEEL-RAIL FRICTION AND ENGINE NOISE**

The freight damage task consists of three areas: (1) identification and description of a freight car system for analysis to yield information for L&D problems faced by industry, (2) modelling of system, and (3) modelling of freight/packaging systems. The wheel-rail friction portion requires setup of a friction-creep test facility with improvements to equipment obtained from General Motors and performing tests to validate test results with previous tests. Engine noise investigations of structural vibration related noise radiation from the GM645E series engine are being performed.

Fifty percent funded by industry (AAR and GM-EMD).  
 REFERENCES:  
 Noise Investigation of a Railroad Diesel Engine Srivastava, N; Kumar, S,

Illinois Institute of Technology, IIT-TRANS-74-1, May 1974, PB-232625/2  
Friction-Creep and Wear Studies for Steel Wheel and Rail Karamchandani, KC; Kumar, S; Sciammarella, CA; Seth, B; et al, Illinois Institute of Technology, IIT-TRANS-75-1, May 1975

A Mathematical-Computer Simulation of the Dynamics of a Freight Element in a Railroad Freight Car, Shum KL; Willis, T, Illinois Institute of Technology, IIT-TRANS-75-2, May 1975

Structural Vibration Noise Abatement of a Large Diesel Engine, Varma, PK; Kumar, S, Illinois Institute of Technology, IIT-TRANS-72-2, Jan. 1976

Study of Friction and Creep Between Steel Wheels and Rail Sciammarella, C; Press, MD; Kumar, S; Seth, B; et al, Illinois Institute of Technology, IIT-TRANS-76-2, Mar. 1976

PERFORMING AGENCY: Illinois Institute of Technology

INVESTIGATOR: Kumar, S

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel (202) 426-4377)

Contract OS-40103

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1974 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$120,000

ACKNOWLEDGMENT: FRA

03 058514

#### FATIGUE ANALYSIS OF PROTOTYPE TANK CAR HEAD SHIELD

Impact tests will be conducted utilizing an instrumented freight car truck for over-the-road tests. All tests are to be conducted with the head shield attached to the tank car in a manner such that there is a direct connection between the stub sill and shield support or there is sufficient damping to eliminate the vertical motions of the shield. The test plan shall give consideration to the following: (a) Specification of additional instrumentation requirements for both the additional impact tests and the over-the-road tests. (b) Delineation of test train operation variables, i.e., speed, length of run, track and terrain conditions, consist makeup, stop and start operation and off-site test requirements.

PERFORMING AGENCY: IIT Research Institute

SPONSORING AGENCY: Transportation Systems Center, RR-525

RESPONSIBLE INDIVIDUAL: Raab, AR (Tel (617)494-2539)

Contract DOT-TSC-1043 (CPFF)

STATUS: Active NOTICE DATE: July 1976 START DATE: May 1975 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$102,015

ACKNOWLEDGMENT: TRAIS (RR-525)

03 058674

#### INCREASED RAIL TRANSIT VEHICLE CRASHWORTHINESS IN HEAD-ON COLLISIONS

The effort will focus on recommendations concerning the longitudinal distributions of mass and force-deformation characteristics for urban railcars which will result in the least loss of life or serious injury due to head-on and rear-end collisions. These recommendations are to be developed as functions of such parameters as: 1. the number of cars in the consist, 2. the overall dimensions and weight of each car, 3. the placement and dimensions of windows and doors, 4. the placement and weights of mechanical equipment, 5. the interior configurations for passengers, 6. the velocity of the consists at impact, 7. carbody force-deformation characteristics, 8. the locations of carbody centers-of-gravity.

PERFORMING AGENCY: IIT Research Institute

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, UM-504

Contract TSC-1052 (CPFF)

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: June 1975 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$279,204

ACKNOWLEDGMENT: TRAIS (UM-504)

03 058677

#### GENERAL VEHICLE TESTING OF STANDARD LIGHT RAIL VEHICLE

The SLRV acceptance tests to be conducted at the TTC will be expanded to include the baseline tests defined in TSC's General Vehicle Test Plan.

These tests will be conducted concurrently with the appropriate acceptance tests to avoid duplication of effort. Permanent records of test data will be provided on magnetic tape for data analysis. The instrumentation package being provided by the Boeing Vertol Company for acceptance testing will serve as partial instrumentation for the General Vehicle Tests. Additional instrumentation and test equipment will be supplied as Government Furnished Property (GFP) to supplement the Boeing instrumentation package for General Vehicle testing at the TTC.

PERFORMING AGENCY: Boeing Vertol Company

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, UM-504

Contract TSC-1062 (CPFF)

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: June 1975 COMPLETION DATE: June 1976 TOTAL FUNDS: \$108,908

ACKNOWLEDGMENT: TRAIS (UM-504)

03 058726

#### PROCUREMENT OF AN IN-TRACK WHEEL RIM INSPECTION SYSTEM

The system will be capable of detecting defects in wheel rims of trains moving at speeds up to 20 MPH.

PERFORMING AGENCY: Scanning Systems, Incorporated

INVESTIGATOR: Cowan, G deG (Tel (203)748-6117)

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

RESPONSIBLE INDIVIDUAL: Yearwood, KW (Tel (617)494-2123)

Contract TSC-1070 (FFP)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$113,426

ACKNOWLEDGMENT: TRAIS

03 081786

#### RAILROAD COUPLER SAFETY RESEARCH AND TEST PROJECT

Because of the recognition of a general lack of knowledge regarding the environment to which couplers and yokes are subjected because of the increased power from modern locomotives, higher operating speeds and increased use of high capacity cars, this project has as its objectives: (1) Study the operating and service conditions of couplers and yokes; (2) Investigate the technical, economic and safety aspects of coupler failures in service; (3) Evaluate standard coupler and yoke designs; (4) Prepare detailed guidelines for the proposed performance and test specifications for couplers and yokes; (5) Conduct a preliminary evaluation of current standard designs of coupler components under conditions listed in Item 4. Data has been acquired from instruments installed in a special test box car which has operated in various services. The With service testing nearly complete, attention is now being given to laboratory tests required for recommendations for purchase and acceptance specifications. Fatigue and fracture toughness characteristics of steels used in couplers and the stress levels in the components must be determined. Agreement has been given to merge this project into Phase II of the Track-Train Dynamics Project, Task 5. All of the objectives of the Coupler Safety Project will be retained.

PERFORMING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

INVESTIGATOR: Morella, NA (Tel (216) 229-3400)

SPONSORING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Morella, NA (Tel 216-229-3400)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: 1972

ACKNOWLEDGMENT: AAR

03 081787

#### RAILROAD TRUCK SAFETY RESEARCH AND TEST PROJECT

This project has the objective of developing guidelines for new specifications for truck bolsters and side frames to meet the increasingly strenuous demands of rail freight transportation. Road service environmental tests to measure loads/stresses to which components are subjected under all types of operating conditions are essentially complete. IITRI reduction and

analysis of recorded data is being translated to methods of laboratory bolster dynamic tests. Initial lab tests of 1975 and 1976 were conducted at the Test Engineering Department of American Steel Foundries. Further lab testing started in November, 1976, and continues into 1977 at the Testing Laboratory of Dresser Transportation Equipment, Division of Dresser Industries. This work is to be used as environmental and physical test basis for the Track Train Dynamics Phase II task on trucks.

**PERFORMING AGENCY:** Association of American Railroads Technical Center; Railway Progress Institute  
**INVESTIGATOR:** Evans, RA (Tel (312)567-3598)  
**SPONSORING AGENCY:** Association of American Railroads Technical Center; Railway Progress Institute  
**RESPONSIBLE INDIVIDUAL:** Evans, RA (Tel (312)567-3598)

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** 1973 **TOTAL FUNDS:** \$190,000

**ACKNOWLEDGMENT:** AAR

**03 081798**  
**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 3--TRUCKS AND SUSPENSION**

Overall task objectives are the development of recommended performance specifications and test specifications for conventional three piece trucks. Specifications will be developed through a comprehensive research project built upon the RPI-AAR Railroad Truck Safety Research and Test Project and utilizing dynamic simulation computer models developed in Phase I of the Track Train Dynamics Program. Test specification development will involve determination of service loading and development of techniques necessary for predicting failure under dynamic loads. Task will also involve developing capability to fatigue test truck components. Field testing will include validation of the truck stability model developed by Clemson University and Arizona State University in conjunction with FRA and the TTD program. The model evaluates dynamic stability of a truck under a wide variety of service conditions and validation will enable it to be used in study of phenomena such as truck hunting. The Harmonic Roll Series computer programs have been used to show how suspension characteristics could be matched with the vehicle to alleviate problems related to rock and roll and harmonic bounce.

**PERFORMING AGENCY:** Association of American Railroads Technical Center  
**INVESTIGATOR:** Martin, GC (Tel 312-225-9600 Ext 877) Korpics, F (Tel 312-225-9600 Ext 877)  
**SPONSORING AGENCY:** Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency  
**RESPONSIBLE INDIVIDUAL:** Sutliff, DR (Tel 312-225-9600 X-1463)

**STATUS:** Active **NOTICE DATE:** Aug. 1976 **START DATE:** Jan. 1975 **COMPLETION DATE:** Dec. 1977

**ACKNOWLEDGMENT:** AAR

**03 081800**  
**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 4--CAR STRUCTURES**

Task objective is the development of recommended performance specifications and design guidelines for railroad freight car structures. Method will involve development of suitable fatigue analysis approach coupled with evaluation of advanced structural analysis methods. Task will include establishing test program goals for environmental loading tests to be pursued during the program. Test plans will be developed and tests conducted to validate fatigue analysis methods for car structural components. The basic approach adopted is a cumulative damage approach using the methodology which has been used in the aerospace and heavy-equipment industries. Development of interim guidelines using this methodology and presently available load spectrum and material fatigue performance was made available to TTD by ACF Industries. Further work in fatigue methodology and acquisition of additional load spectra from environmental sampling is progressing.

**PERFORMING AGENCY:** Association of American Railroads Technical Center  
**INVESTIGATOR:** Przybylinski, P (Tel 312-225-9600 Ext 862)  
**SPONSORING AGENCY:** Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency  
**RESPONSIBLE INDIVIDUAL:** Sutliff, DR (Tel 312-225-9600 X-1463)

**STATUS:** Active **NOTICE DATE:** Aug. 1976 **START DATE:** Jan. 1975 **COMPLETION DATE:** Dec. 1977

**ACKNOWLEDGMENT:** AAR

**03 081801**  
**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 5--COUPLERS, DRAFTGEAR, AND CUSHION UNITS**

Task objectives are development of recommended performance and/or test specifications and design guidelines for railroad freight car couplers, draftgear, and cushion units. Task will build on current RPI-AAR Railroad Coupler Safety Research and Test Project and will utilize dynamic simulation computer models developed during Phase I of the Track Train Dynamics Program. Coupler effort will concentrate on stress and fatigue analysis. Draft gear and cushion unit efforts will be directed toward investigations of opportunities for improved train handling through optimized operating characteristics.

**PERFORMING AGENCY:** Association of American Railroads Technical Center  
**INVESTIGATOR:** Hawthorne, KL (Tel 312-225-9600 Ext 866) Brown, TR (Tel 312-225-9600 Ext 866)  
**SPONSORING AGENCY:** Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency  
**RESPONSIBLE INDIVIDUAL:** Sutliff, DR (Tel 312-225-9600 X-1463)

**STATUS:** Active **NOTICE DATE:** Aug. 1976 **START DATE:** Jan. 1975 **COMPLETION DATE:** Dec. 1977

**ACKNOWLEDGMENT:** AAR

**03 099382**  
**WHEEL RESEARCH PROGRAM**

It is the objective of this program to prevent the formation of cracks in various wheel locations which can occur because of various conditions and can ultimately result in catastrophic failure. The initial step was a full review of wheel failure statistics to isolate wheel contours generating the most frequent failures. The problem is to be alleviated by considering changes in wheel design and wheel material, with emphasis on design. Finite element analysis is conducted on each characteristic shape of wheel involving stress due to tread loading, lateral loading and to thermal inputs resulting from drag or emergency braking. Such analysis would be followed by service or dynamometer tests to verify results. The initial phase of this involved the 28-inch wheel and was a joint project with Trailer Train Co. It involved cracked wheel plates and shattered rims, and indicated some solutions which would be generally applicable. In addition to the loading problems, research is being conducted to define problems associated with overheated wheels. It was initially found that criteria for rejecting such wheels were overly restrictive. Non-destructive residual stress measurement techniques, such as the Barkhausen method, are being evaluated for detecting thermally damaged wheels. The thermal fatigue behavior of wheel steels is also being investigated. Detection of rim thermal cracks, utilizing ultrasonic techniques like those used in AAR's rail test program, are also proceeding.

**PERFORMING AGENCY:** Association of American Railroads Technical Center  
**SPONSORING AGENCY:** Association of American Railroads

**STATUS:** Active **NOTICE DATE:** Aug. 1976

**ACKNOWLEDGMENT:** AAR

03 099414

**THE STRENGTH TESTING OF RAILWAY CARS AND LADING SECURING ARRANGEMENTS TO A.A.R. AND MIL SPECIFICATION FOR INDUSTRY**

Using impact ramp, squeeze frame, jacks and in-service observations associated with strain gauge and accelerometer instrumentation, to assist industry in their car construction and tie down design, and to suggest or develop alternative lading protection devices where necessary.

PERFORMING AGENCY: National Research Council of Canada, Division of Mechanical Engineering

INVESTIGATOR: Watson, WJ (Tel 613-993-2432)

SPONSORING AGENCY: National Research Council of Canada, Associate Committee on Railway Problems

STATUS: Active NOTICE DATE: Aug. 1975

ACKNOWLEDGMENT: National Research Council of Canada

03 099426

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 9-DESIGN STUDY-TANKS AND ATTACHMENTS**

Phase 09 concerns the behavior of tank car tanks and their appurtenances (fittings and attachments) in the mechanical environment of railroad accidents. The objectives are to study designs of tank shells, fittings and attachments in relation to the potential of product loss under mechanical impacts in accidents and to analyze, on a cost-effective basis, the feasibility of reducing losses through design improvements. This general area of study will continue under the Project. Currently, an extensive series of tests and theoretical analyses are planned. The tests will comprise impact testing of several bottom outlet configurations. The objective is to assess present specifications and to improve, where practical, their requirements for safe breakaway designs of bottom fittings and attachments.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970 COMPLETION DATE: 1977

ACKNOWLEDGMENT: AAR

03 099430

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 14-STUB SILL TANK CAR BUCKLING**

This phase concerns buckling which has occurred inboard of the stub still termination on certain designs of non-pressure stub sill cars in either compressive train action or yard impact situations. The problem has been limited to empty cars, indicating that for loaded cars the tensile stresses produced in the bottom fibers of the tank by the lading weight is sufficient to offset the otherwise critical compressive stresses. The primary objective is to determine quantitatively what design and test loads should be specified for such stub sill cars to assure that their resistance to buckling is at least as good as that of all other freight cars. A second objective is to develop data on the brittle lacquer or photostress techniques of experimental analysis, and on the electrical strain gage test procedures and interpretation methods, in order to improve specification requirements in these areas. This work, which will be completed in early 1977 involved static squeezing and dynamic impacting of nine stub sill cars of different designs, four of which have experienced various histories of buckling and five of which are of new improved design. Approximately 80 strain gage rosettes are employed on each car. Conclusions from this work will be made in report form to the AAR Car Construction and Tank Car Committees for their use in adopting specification changes, if deemed necessary.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1974 COMPLETION DATE: 1977

ACKNOWLEDGMENT: AAR

03 099432

**ADVANCED COUPLING CONCEPTS PROJECT**

The objectives of the Advanced Coupling Concepts project are: 1) To determine areas in which safety and efficiency could be improved by changes in the coupling system. 2) To quantify value to be achieved by such improvements. 3) To define functional requirements in the form of a specification to guide development of improved systems. The scope includes all functional elements essential to interfacing of railroad cars and locomotives including mechanical couplers, train lines, etc. An economic model is to be developed and data collected to evaluate new coupling concepts individually and as logically assembled systems.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Punwani, SK

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

Contract TSC-1087 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: 1974 TOTAL FUNDS: \$92,296

ACKNOWLEDGMENT: AAR

03 099435

**LOCOMOTIVE CAB DESIGN DEVELOPMENTS**

The objective of this effort is the development of a locomotive control compartment based on an evaluation of the operator's functional requirements and comprehensive human factors engineering studies. The contractor will develop specifications for the design, test, and evaluation of a locomotive cab which is in concert with all operational, human factors, safety, and occupant protection considerations. The cab design will incorporate the predictable technical and operational progress, as well as 10 to 15 year projections of train handling and control requirements. In Phase I of the contract, a number of potentially feasible conceptual alternative locomotive cab configurations were developed. The most suitable alternate will be selected on the basis of human factors, structural integrity, and cost trade-off studies now in progress. In Phase II, a detailed human factors design of the optimized locomotive cab will be accomplished, and a full scale mock-up fabricated. Operational feasibility will be determined in a limited series of performance tests utilizing the mock-up.

Funds for this project are administered by DOT/Transportation Systems Center, Cambridge, Mass.

## REFERENCES:

Human Factors Engineering Systems Functional Analysis Tech Rpt. No. 1

Analysis of Locomotive Cab Environment and Development of Cab Design Alternatives, Tech Rpt. No. 2

Locomotive Cab Design Development: Operator's Manual

PERFORMING AGENCY: Boeing Vertol Company, D339-10044

INVESTIGATOR: Robinson, J (Tel (215)522-3115)

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

RESPONSIBLE INDIVIDUAL: Jankovich, JP (Tel 617-494-2129)

Contract DOT-TCS-913

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1974 TOTAL FUNDS: \$343,276

ACKNOWLEDGMENT: FRA

03 099439

**HOT JOURNAL SENSOR AND LOCAL DERAILMENT DETECTOR**

This multi-year program is aimed at reducing the number of train derailments. Active anti-derailment devices are needed by the railroad industry which when installed on a train will automatically stop the train upon detection of a hot journal or a wheel on the ground. NAV-SURFWPNCEN/WOL will develop, install and initiate in-service demonstrations of the Hot Journal Sensor (HJS) and the Local Derailment



Detector (LDD) on a limited number of railroad cars. Hot box tests, over-the-road shock tests and normal bearing tests have been conducted on the Duluth, Missabe & Iron Range Railway at Duluth, Minn. Data from these tests will establish a design base for both the LDD and HJS. Laboratory testings has been conducted on a piezo-electric power source for an electro-explosive HJS device.

PERFORMING AGENCY: Naval Surface Weapons Center  
 INVESTIGATOR: Gratton, P  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Levine, D (Tel 202-426-1227)

IA AR54162  
 STATUS: Active NOTICE DATE: July 1976

ACKNOWLEDGMENT: FRA

**03 128045**

**URBAN RAIL BOGIE DESIGN**

A thorough investigation of the curving and stability characteristics of LRV bogies is being conducted to determine if it is possible to design a bogie which is stable up to 60 mph and can negotiate small radius curves without flange contact or wheel slip. First it is being determined if it is possible to provide the above performance with a simple self-steered bogie with flexible suspensions which allow the axles to align themselves radially in a curve through the action of creep forces between wheel and rail. If studies conclude that a self-steered bogie will not satisfactorily negotiate small enough radii curves, further investigations will be concentrated on steered bogies which mechanically yaw the axles radially during curve running. The feasibility of such a design for LRV's will be determined. National Research Council is currently interested in improving the curving ability of freight cars by use of steered bogies and it is expected that a cooperative effort will benefit both projects. This research studies the case of steel wheels negotiating short radii typical of LRV applications without flange contact to minimize noise, wear and risk of derailment, and which requires vehicle suspension characteristics in conflict with good stability at speed and continues the development of basic tradeoffs of lateral stability curving for self steering bogies and analytical models. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communic, Can, 3110  
 INVESTIGATOR: Young, J Elliott, L  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communic, Can

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

**03 128046**

**WHEEL/RAIL NOISE PROJECT PHASE II**

In phase I a thorough understanding of the mechanics of wheel/rail noise generation was obtained. Wide disparity in the test conditions made it impossible to rank the existing wheel designs in order of their acceptability. However, qualitatively, the Bochum wheel was judged the best design. Two new wheel concepts resulted from the phase I study, both of which were based on the Bochum wheel. As a first step in the evaluation of these new designs, it is proposed to construct a model of each. These models will be used to study their physical properties with reference to noise generation mechanics. Thus the degree of coupling between radial and axial wheel motion and the wheel natural frequencies and the associated modal damping will be found. Similar data for the Bochum and S.A.B. wheels does not exist and it will be necessary to conduct similar experiments on these wheels. Extension will complete the design and dynamic experiments on the new wheel concepts. In addition, it is proposed to establish the validity of the finite element model of a railway wheel.

PERFORMING AGENCY: Ontario Ministry of Transportation & Communic, Can, 3109  
 INVESTIGATOR: Curmi, RA Elliott, GI  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communic, Can

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

**03 136342**

**DESIGN OF AN ADVANCED CONCEPT TRAIN**

Description: The object of this project is to demonstrate new concepts for the subway and commuter rail car industry. These concepts will reduce life cycle costs; increase passenger appeal; and reduce the impact on the environment. Two vehicles are being built for demonstration of the operating properties. The methods for reducing life cycle costs are: 1. An efficient propulsion system which stores the vehicle braking energy in a flywheel to be used later to accelerate the vehicle. All accessories are shaft driven from this flywheel. 2. Reliability-Designing for reliability and designing parts out of the vehicle. 3. Designing more maintainable equipment. 4. Reducing operating personnel by automaticity and closed circuit T.V. monitors. 5. Reducing track wear thru a better slip-slid control and better ride quality. Ridership will be increased by: 1. Better ride quality thru a new type suspension and truck design. 2. Better air conditioning. 3. Reduced noise levels. 4. Improved exterior and interior vehicle aesthetics. Less environmental impact thru: 1. Reduced noise using composite wheels. 2. Less thermal emission since the braking energy is stored as rotational energy interferences due to advanced propulsion design.

PERFORMING AGENCY: Garrett Corporation; Boeing Vertol Company  
 INVESTIGATOR: O'Brien, T  
 SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Teel, SS (Tel (202)426-0090)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1978

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (JBO 12 1)

**03 138536**

**DEVELOP WHEEL-CHAIR ELEVATOR FOR STANDARD LIGHT RAIL VEHICLE (SLRV)**

The objective is to design, fabricate and test a prototype wheelchair elevator system for the SLRV. It will be tested on an SLRV MOCK-UP, and will be optimized on configuration, actuation and time cycle. The device will include facilities for self-operation by occupant with motorman override control, and will have positive restraints to prevent chair movement on platform and safety interlocks between elevator, car doors, and propulsion system. The platform will accommodate standing patrons unable to climb vehicle steps, or persons in wheelchairs.

PERFORMING AGENCY: Boeing Vertol Company  
 SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Mora, J (Tel (202) 426-0090)

Contract DOT-UT-60045

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$126,000

ACKNOWLEDGMENT: UMTA

**03 138537**

**GAS TURBINE-ELECTRIC (GT-E) COMMUTER CARS**

The objective is to develop a dual-powered advanced commuter car capable of gas-turbine or electric propulsion which is equivalent to all-electric car performance and can provide a no-change ride to suburbs beyond electrified territory. Each of the four-car trains began revenue Transportation's Transportation Test Center, Pueblo, Colo. Both the Garrett and General Electric cars began non-revenue testing on the Long Island Rail Road in 1975. All eight cars will be put into revenue service on the LIRR for extended evaluation.

Subcontractors are Garrett AiResearch and General Electric Company.

PERFORMING AGENCY: New York State Metropolitan Transportation Auth  
 SPONSORING AGENCY: Urban Mass Transportation Administration; New York State Metropolitan Transportation Auth  
 RESPONSIBLE INDIVIDUAL: Mora, J (Tel (202) 426-0090)

Contract DOT-UT-613

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$14,800,000

ACKNOWLEDGMENT: UMTA

03 138538

**RAILCAR STANDARDIZATION--PHASE I**

The objective of the combined UMTA/transit industry effort is to determine the feasibility of rail rapid transit car standardization, the appropriateness of various degrees of standardization, and the potential benefits to be derived therefrom. If standardization is found, to be feasible, a second phase of the project will be initiated to develop a standardized family of specifications. With the goal of achieving lower per unit cost (first cost and life cycle), reduced maintenance problems and costs, increased car availability, reduced requirements for car customization, and provision for evaluatory improvement in technology.

PERFORMING AGENCY: International Research and Technology  
SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Mora, J

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1976  
COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$86,000

ACKNOWLEDGMENT: UMTA

03 138539

**ADVANCED SUBSYSTEMS DEVELOPMENT PROGRAM (ASDP)**

The objective of this investigation, a part of the Urban Rapid Rail Vehicle Systems Program, is to achieve transit vehicles that are as reliable, safe and economical as possible, choosing subsystems which reduce the cost of operation and maintenance, reduce energy requirements and/or improve safety, comfort and performance. The components chosen as having the greatest potential payoff are the self-synchronous a-c traction motor, the monomotor truck with active suspension and the synchronous spin-slide control braking system with improved emergency stopping capability.

Subcontractors are Delco Electronics, Budd Company and Westinghouse Air Brake Division.

PERFORMING AGENCY: Boeing Vertol Company  
INVESTIGATOR: O'Brien, T  
SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation  
RESPONSIBLE INDIVIDUAL: Teel, SS (Tel (202)426-0090)

Contract DOT-UT-10007  
STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec. 1975  
COMPLETION DATE: June 1979 TOTAL FUNDS: \$11,300,000

ACKNOWLEDGMENT: UMTA

03 138542

**STATE-OF-THE-ART CARS**

To demonstrate the best available in current rapid rail technology to transit authorities and to the general public, this program has involved the construction, test and evaluation of two state-of-the-art rapid transit cars. Tests were conducted on operating properties in the U.S. with a new extended-test phase starting on the Philadelphia-area Port Authority Transit Corp. in September 1976.

PERFORMING AGENCY: Boeing Vertol Company  
INVESTIGATOR: O'Brien, T  
SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Teel, SS (Tel (202) 426-0090)

Contract DOT-UT-10007  
STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec. 1971  
COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$5,875,941

ACKNOWLEDGMENT: UMTA

03 138559

**VEHICLE INSPECTION**

Provides surveillance and non-destructive inspection of both vehicle and components. Directs and monitors government and contractor development and evaluation efforts in the areas of automated vehicle on-board surveillance, wayside inspection, and non-destructive inspection of components. Provides for the design and fabrication of transducer, computerized data collection and automated detection systems.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division  
SPONSORING AGENCY: Federal Railroad Administration, Department of

Transportation

RESPONSIBLE INDIVIDUAL: Winn, JB (Tel (202) 426-1682)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1976

ACKNOWLEDGMENT: FRA

03 138565

**ROLLING STOCK SAFETY**

The goal of the Rolling Stock Safety Program is to improve railroad safety through the development of (a) performance criteria for vehicles and vehicle components which are less prone to failures, (b) techniques and mechanics for predicting, detecting, and reacting to the failures which do occur, and (c) concepts to increase the accident survivability of vehicle occupants. Work is being undertaken concerning locomotives, hazardous material tank cars, component failure prevention, and track-train dynamics.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Levine, D (Tel (202) 426-1227)

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1976

ACKNOWLEDGMENT: FRA

03 138796

**RADIAL-AXLE FREIGHT CAR TRUCKS**

Agreement with South African Inventions Development Corp. covers application of radial-axle freight car trucks in North America based on Scheffel principles originated on South African Railways. Special wheel tread profile and diagonal bracing between axles minimize flange guidance in curves. Reductions in truck hunting, and wheel and rail wear are major objectives.

See also 03A 138797 this bulletin.

PERFORMING AGENCY: Standard Car Truck Company

INVESTIGATOR: Bullock, RL

SPONSORING AGENCY: Standard Car Truck Company

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: 1975

03 138797

**RADIAL-AXLE PASSENGER CAR TRUCKS**

Agreement with South African Inventions Development Corp. covers development and prototype testing in North America of radial-axle trucks for main-line passenger, commuter and transit cars based on Scheffel principles organized on South African Railways. Objectives include improved running stability and riding comfort, and decreased wheel and rail wear.

See also 03A 138796 this bulletin.

PERFORMING AGENCY: General Steel Industries, Engineering Division

INVESTIGATOR: Jackson, KL

SPONSORING AGENCY: General Steel Industries, Engineering Division

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: July 1976

03 148336

**HOPPER-BOTTOM BOXCAR FOR RAILROAD TRANSPORTATION**

Two prototype hopper-bottom box cars will be evaluated in various shipping experiments. The economics, engineering and operation of the cars will be studied. The potential for relieving seasonal car shortages for grain and soybeans will be appraised. The cars will haul bulk grain in one direction and packaged or palletized products or lumber on all or most return trips. Costs of transportation with the two cars will be compared with costs of the same amount of service from conventional covered hopper cars or box cars.

See also 03A 099634.

PERFORMING AGENCY: Chicago, Milwaukee, St. Paul and Pacific Railroad

SPONSORING AGENCY: Department of Agriculture, Agricultural Research Service; Chicago, Milwaukee, St. Paul and Pacific Railroad

RESPONSIBLE INDIVIDUAL: Breakiron, PL

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1976 COMPLETION DATE: 1978 TOTAL FUNDS: \$60,000

ACKNOWLEDGMENT: Department of Agriculture

03 148337

## HOPPER-BOTTOM BOXCAR EVALUATION

The purpose of this agreement between the FRA and USDA is to perform an engineering evaluation of the Hopper-Bottom Boxcar concept. The evaluation is to be accomplished in connection with a one-year in-service demonstration program conducted through a cooperative agreement between the Chicago, Milwaukee, St. Paul and Pacific Railroad Company and USDA. FRA goals and objectives include determining technical feasibility of the concept, obtaining user acceptance, increased car utilization; establishing reliability and maintainability data, development of a system performance-type specification, evaluation of different design alternatives, and conduct of a one-year in-service pre-prototype engineering evaluation.

See also 03A 099634.

### REFERENCES:

Feasibility of Developing a Hopper-Bottom Boxcar for Railroad Transportation of Grain and Soybeans, Kearney (AT) Inc., under contract to USDA, June 1974

PERFORMING AGENCY: Federal Railroad Administration, Office of Freight Systems, Freight Service Division; Department of Agriculture, Agricultural Research Service

INVESTIGATOR: Koper, JK (Tel (202)426-0808)

SPONSORING AGENCY: Department of Agriculture, Agricultural Research Service; Federal Railroad Administration, Office of Freight Systems, Freight Service Division

RESPONSIBLE INDIVIDUAL: Breakiron, PL (Tel (301)344-2815)

STATUS: Programmed NOTICE DATE: Feb. 1977 COMPLETION DATE: Jan. 1979 TOTAL FUNDS: \$170,000

ACKNOWLEDGMENT: FRA

03 148345

## RAILROAD TANK SAFETY RESEARCH AND TEST PROJECT. PHASE 16-TANK CAR WEAR EXPERIMENTS

In the FAST program at the DOT Test Center 18 tank cars will eventually accumulate a total of approximately 160,000 miles. These tank car accelerated Life Tests (ALT) will provide an in service reliability of both insulations, jacket-type and sprayed-on-coating-type thermal shields. Phase 16 has been established to cover the various tank car component measurements (wheels, trucks, center plates, brake shoes, etc.) as related to wear. See also 12A 900425.

PERFORMING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration

SPONSORING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel (312)567-3607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1976

ACKNOWLEDGMENT: Association of American Railroads Technical Center

04 048972

**ENERGY STORAGE CARS (ESC) TEST PLANS**

The objective of this contract is to expand the original High Speed Ground Test Center (HSGTC) Energy Storage Cars (ESC) test plans to be consistent with the standard procedures defined in TSC's General Vehicle Test Plan, GSP-064, in order to collect additional data to aid in the evaluation of the Energy Storage System for application to rail cars.

PERFORMING AGENCY: AiResearch Manufacturing Company of California

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

Contract TSC-838 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: June 1974 TOTAL FUNDS: \$41,140

ACKNOWLEDGMENT: TRAIS

04 054561

**ON BOARD ENERGY STORAGE FOR TRANSIT CARS**

Description: The design, development and testing of an electric propulsion system with an onboard energy storage unit for use on subway cars. The kinetic energy of the moving car during braking is directed to a motor driven flywheel resulting in storage of the energy by increasing the speed of the flywheel. During acceleration the flywheel energy is released and supplies the majority of power required for acceleration of the car. Performance by computer analysis indicates a potential energy savings of 30% and peak power reduction as high as 60% over a typical NYCTA track profile. Verification of performance compared to conventional cars will be accomplished by operation on the NYCTA subway lines.

PERFORMING AGENCY: Metropolitan Transportation Authority of New York

SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Mora, J (Tel (202)426-0090)

Contract DOT-UT-550

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$1,900,000

ACKNOWLEDGMENT: UMTA

04 058270

**ELECTRIFICATION AND ELECTRIC TRACTION**

This sub-program is a continuous effort and is concerned with advanced analytical and laboratory studies in electrical propulsion, as well as basic studies for electrification. The work includes power conditioning systems, linear electric motors, power collection, power distribution, and cost analyses.

PERFORMING AGENCY: Transportation Systems Center

INVESTIGATOR: Raposa, FL (Tel 617-494-2031)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Guarino, M (Tel (202) 426-9564)

PPA-RR-05

STATUS: Active NOTICE DATE: Feb. 1977

ACKNOWLEDGMENT: FRA

04 058280

**POWER AND PROPULSION SYSTEM, TECHNICAL AND SCIENTIFIC SERVICES AND DATA**

Task effort is to include: (1) energy charging analysis and charger station requirements for flywheel propulsion systems for various urban vehicles; (2) power conditioner surveys for the linear synchronous motor; (3) cost data and economic analysis of linear electric motor propulsion systems; (4) review of advanced propulsion, power, and train control approaches for improved freight operations; (5) updating of cost data of wayside power supply systems; (6) design analysis, including both magnetic field and circuit modeling of synchronous and asynchronous linear motors; (7) complex computer modeling and analysis of propulsion drive systems.

PERFORMING AGENCY: Kusko (Alexander) Incorporated

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Raposa, FL (Tel (617)494-2031)

Contract DOT-TSC-965 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$219,000

ACKNOWLEDGMENT: TRAIS (612-0218)

04 099377

**FLYWHEEL ENERGY STORAGE UNIT FOR YARD SWITCH ENGINES-FEASIBILITY STUDY**

The objective of this research is to determine the technical and economic feasibility of employing flywheel energy storage technology to yard switch engines as a potential means of reducing fuel consumption, noise levels, exhaust emissions and overall maintenance costs. This work will include the development of a "breadboard" installation for testing with a 1500 HP locomotive. A trailing car will be used to house the flywheel unit and the necessary control integration and traction motor modification will be made to a railroad-furnished switcher. Four different railroads will assist in conducting 90-day operational evaluations.

The contract to a performing organization has not yet been awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr (Tel 202-426-0855)

STATUS: Proposed NOTICE DATE: July 1976 START DATE: Oct. 1976 COMPLETION DATE: Oct. 1979

ACKNOWLEDGMENT: FRA

04 099440

**METROLINER AUXILIARY POWER**

The objective is to examine the possibility of substituting solid-state inverters for the motor alternator sets that supply the auxiliary power system on self-propelled Metroliner cars.

PERFORMING AGENCY: Transportation Systems Center

INVESTIGATOR: Raposa, FL

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Gannett, CM (Tel 202-426-9655)

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: July 1975 COMPLETION DATE: July 1976

ACKNOWLEDGMENT: FRA

04 128005

**PROPULSION SYSTEM DESIGN RATIONALE**

A review of propulsion systems around the world reveals a very wide range of capacities in relation to vehicle mass and maximum speed gradients. The purpose of this project is to discover and set down fundamental reasons to account for the choice of a specific propulsion system. Basic laws of motion will be reviewed with a view to discovering relations between average speed, maximum power, energy consumed and trip distance. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communic, Can, 3405

INVESTIGATOR: Duncan, I

SPONSORING AGENCY: Ontario Ministry of Transportation & Communic, Can

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

04 128008

**FLYWHEEL ENERGY STORAGE STUDY. PHASE I. TECHNOLOGY REVIEW AND FEASIBILITY STUDY**

The purpose of this project is to conduct a technology review and data acquisition of existing operational flywheel units as well as of flywheel units that are being actively developed. The units to be considered are complete energy storage systems including the flywheel itself, the input/output motor and controls and the ancillary systems such as the vacuum, lubricating, safety and containment systems. The factors of interest are the cost, energy storage properties and efficiencies, size and weight, reliability, safety, etc. This project will further conduct a preliminary assessment of the feasibility and viability of flywheel energy storage in rail transportation using a benefit

cost analysis. This will lead into the Phase II study (if feasibility has been established) which will investigate actual flywheel energy storage applications and uses in terms of cost effectiveness, both in on-board and in-station configurations. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication  
 INVESTIGATOR: Soots, V Palm-Leis, A  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communication

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

**04 135721  
 DESIGN OF IMPROVED FLYWHEEL-TYPE ENERGY STORAGE DEVICES USING HIGH-STRENGTH FILAMENTS**

Description: The purpose of this research is to develop more efficient designs of flywheels for energy storage applications in ground vehicles. Particular emphasis is placed on those using high-strength filament materials. Specifically, these types of flywheels are being investigated. 1. Radial brush type. 2. Laminated disk, consisting of multiple layers of filamentary composite material at various orientations. 3. Filament-wound disk. 4. Wound-rim type. 5. Concentric-ring type. The approach used is to perform stress analyses, using modern techniques of elastic and plastic mechanics and mechanics of filamentary and laminated composite materials. Then the stress analyses are used to arrive at optimal design for each of the configurations listed. To date, the first two types have been investigated and it was found that previous analyses found in the literature contain some serious errors. Future effort will be directed toward the other configurations listed above and to design optimization for vehicular applications.

PERFORMING AGENCY: Oklahoma University, School of Aeronautical and Mechanical Engineering  
 INVESTIGATOR: Bert, CW  
 SPONSORING AGENCY: Oklahoma University

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (NDY 19 1)

**04 135723  
 ENERGY CONVERSION, ENERGY STORAGE AND RECONVERSION**

To develop a family of systems for storing electrical energy and thereafter re-utilize the stored energy in various ways. In storage, major emphasis has been in the development of high-pressure (1000 to 3000 PSI) moderate temperature (300 to 400 degrees Fahrenheit) electrolysis cells, fuel cells and rechargeable fuel cells for the storage of electrical energy in the forms of high-pressure hydrogen gas (other alternatives include hydrides and liquid hydrogen). The stored hydrogen can be used in many ways: mechanical output: hydrogen engine, Aphodid burner turbine electrical output: fuel cells, high-speed turbine field modulated generator system heat output: burners synthetic fuel output: conversion of organic materials to hydrocarbon fuels. In reconversion, the emphasis at present is to develop a family of variable-speed constant (or adjustable) output frequency alternators by applying the field modulated frequency down conversion principle. These alternators will be driven at high speeds (around 10,000 RPM or higher) and consequently will be much smaller in size than conventional alternators of similar capabilities. Application of field modulated frequency down converters for variable speed mechanical inputs such as aeroturbines (wind energy systems) and for variable speed drive applications such as urban cars and prime-mover carrying mass transportation systems are currently being studied.

PERFORMING AGENCY: Oklahoma State University, School of Electrical Engineering  
 INVESTIGATOR: Hughes, WL Allison, HJ Ramakumar, R Lingelbach, DD  
 SPONSORING AGENCY: Oklahoma State University

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (NOK 99 1)

**04 136017  
 ENVIRONMENTAL ENGINEERING AND ENERGY MANAGEMENT (FLYWHEEL ENERGY STORAGE SYSTEM)**

The objective is to apply advanced space technology to the development of flywheel energy storage systems for application to ground transportation. The technical approach will include in-house studies and system simulations, and contracted efforts to fabricate the composite material flywheel energy storage system, mobile test vehicle, and test equipment. After interim testing of the vehicle with a battery set, the flywheel system will be integrated and final testing accomplished. The flywheel energy storage system for use on mobile vehicles for ground transportation will provide benefits in the areas of pollution control and more efficient utilization of energy sources. In addition, low maintenance and long life are expected from this concept.

PERFORMING AGENCY: Langley Research Center, National Aeronautics and Space Administration  
 INVESTIGATOR: Graves, GB  
 SPONSORING AGENCY: Langley Research Center, National Aeronautics and Space Administration

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange

**04 141173  
 DEVELOPMENT OF MOLTEN SALT BATTERIES FOR UTILITY LOAD LEVELING AND ELECTRIC VEHICLE APPLICATIONS**

DESCRIPTION: Storage batteries, as an addition and alternative to pumped hydro, have attracted considerable interest throughout the electric utility industry. Dispersed location, short lead time for construction and minimal aesthetic impact are some of the obvious advantages. With a view to developing an economical high-energy secondary battery system suitable for peaking power applications, this project is currently directed toward the design, assembly, testing and evaluating of a molten sodium chloride battery which would operate at temperatures below those of most high energy density batteries. In later phases of this work, larger units will be developed and tested under conditions simulating those expected in actual load leveling service. In a separate aspect of this molten salt battery R&D, work is being done toward developing a different battery system for electric vehicle applications, initially for use in fork-lift trucks. Initial work on this latter system, a lithium/aluminum/tellurium battery called Carb-Tek(r), was performed by the Standard Ohio Co. (Ohio). ESB, under an agreement with SOHIO, is continuing this development with the sponsorship of the U.S. Army M.E.R.D.C.

PERFORMING AGENCY: ESB Incorporated  
 INVESTIGATOR: Werth, J Schaefer, J  
 SPONSORING AGENCY: Department of the Army, Department of Defense, RP109

STATUS: Active NOTICE DATE: May 1976 START DATE: Jan. 1976 COMPLETION DATE: Dec. 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GTR 347 1)

05 058254

**STUDY OF ADVANCED FREIGHT CAR BRAKING SYSTEMS**

This study of alternative freight car braking systems is to determine the degree to which any existing concepts represent practical improvements in conventional freight operations. This technology assessment is not limited to alternatives which have been considered for high speed passenger trains, but is to include all known alternatives. The specific tasks include: 1) Detailed delineation of the functional performance of the present air brake system, including consideration of available optional equipment; 2) establishment of detailed life-cycle cost information for the existing system; 3) identification of areas in which the present system could be improved; 4) identification of alternative braking techniques/concepts; 5) analysis of those alternatives; and 6) recommendation of a research and development plan.

PERFORMING AGENCY: Kearney (AT) and Company, Incorporated  
 INVESTIGATOR: Eshelman, L (Tel (312)782-2868)  
 SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Hazel, M (Tel (617)494-2528)

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: 1976

ACKNOWLEDGMENT: FRA

05 081802

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 6--BRAKE SYSTEM**

Task objective is evaluation of the performance of present braking systems to identify those areas where improvements would result from the establishment of performance specifications and/or design guidelines. Evaluation will include stopping distance, reaction time, recharge time, wheel tread temperatures, rigging efficiency, etc. Evaluation will include parametric sensitivity study utilizing dynamic simulation computer models developed in Phase I of the Track Train Dynamics Program. If desirable, field testing of modified braking systems will be conducted. Task will also include field testing of effects on stopping performance caused by different brake shoes. These tests will be single car "breakaway" tests and will be augmented to full train characteristics using the dynamic simulation computer models.

PERFORMING AGENCY: Association of American Railroads Technical Center  
 INVESTIGATOR: Misner, GR  
 SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Development Agency  
 RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: July 1976 START DATE: Jan. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: AAR

05 138570

**ADVANCED BRAKING STUDY**

This cooperative effort aims to describe mathematically the performance of pneumatic braking systems. The four phases are intended to culminate in recommendations for an advanced braking system. Phase I investigated the level of coupler force during various stopping situations with several train blocking types, utilizing a validated model of braking action produced by Westinghouse Air Brake. Phase II is aimed at describing the braking system in terms of mass, momentum and other relationships, rather than empirical equations. The first step was describing the ABD valve function.

## REFERENCES:

Investigation of Intrain Forces During Freight Train Brake Applications by Computer Simulation, Canadian National Railways  
 Symbolic Representation of the ABD Brake Valve Canadian National Railways

PERFORMING AGENCY: Association of American Railroads Technical Center; Canadian National Railways  
 SPONSORING AGENCY: Association of American Railroads; Canadian National Railways

STATUS: Active NOTICE DATE: July 1976

05 148340

**STUDY OF ADVANCED PASSENGER TRAIN BRAKING SYSTEMS**

Purpose is to assess the functional performance and economics of various concepts for electromagnetic braking systems for use on locomotives, powered coaches, and non-powered coaches in passenger train operations. The assessment is to be carried out on all such systems in use or proposed regardless of the degree of development to actual hardware. Emphasis of the study will be upon those braking systems which utilize eddy-current effects for the braking force. A comparison study will also be made of braking systems in common use.

PERFORMING AGENCY: Kearney (AT) and Company, Incorporated  
 INVESTIGATOR: Eshelman, L (Tel (312)782-2868)  
 SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Hazel, M (Tel (617)-494-2757)

Contract DOT-TSC-1298

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1976 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$44,900

ACKNOWLEDGMENT: TSC

06 099410

**THE DEVELOPMENT OF A TRAIN LOCATION IDENTIFICATION AND CONTROL SYSTEM**

The objective of this study is the development of locomotive identification and control techniques for railway signalling applications. The work includes: (a) Definition of operational requirements. (b) Conduct of system design and preparation of technical specifications. (c) Specification, design, construction and factory tests of locomotive control unit, cab signalling unit, microwave site unit, computer interface unit, and test panel. (d) Provision of assistance in the installation of the above equipment on British Columbia Railway property and conduct of field test and debugging of system.

PERFORMING AGENCY: Glenayre Electronics Limited  
 INVESTIGATOR: Francis, JR (Tel 604-980-6041)  
 SPONSORING AGENCY: Transportation Development Agency  
 RESPONSIBLE INDIVIDUAL: Rudback, NE (Tel 514-283-4077)

STATUS: Active NOTICE DATE: July 1976 START DATE: Feb. 1975 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$184,670

ACKNOWLEDGMENT: Transportation Development Agency

06 099422

**MANNED/UNMANNED TRANSIT SYSTEMS STUDY**

This project will compare and evaluate the technical capabilities and safety aspects of two types of transit systems--one with on-board human control, the other fully automated with no on-board human control. The principal factors to be studied will be: public acceptance; safety and security for the passengers; and the reliability, maintainability and life cycle costs and benefits for the system. The findings are intended for use by authorities faced with advertising or deciding on selection and development of new systems. The project was started in the Office of the Secretary of Transportation where it was known as "Automatic Train Control Study" and was transferred to UMTA in April 1974 for expansion and completion.

PERFORMING AGENCY: Transportation Systems Center  
 SPONSORING AGENCY: Urban Mass Transportation Administration

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1974 TOTAL FUNDS: \$70,000

ACKNOWLEDGMENT: UMTA

06 129714

**OPTICAL ACI INVESTIGATION**

Investigation of different techniques involved in receiving retroreflective light from the color coded label and the associated signal processing will lead to a set of engineering requirements and a set of relevant performance specifications. This effort will define a more optimized system with increased performance especially readability.

PERFORMING AGENCY: Transportation Systems Center  
 INVESTIGATOR: Ingraio, HC (Tel 617-494-2373)  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr (Tel 202-426-0855)

Contract PPA-RR-716

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$515,000

ACKNOWLEDGMENT: FRA

06 130950

**LARGE SCALE CONTROL SYSTEMS**

This project focuses on the development of concrete analysis and synthesis methods for a number of problems associated with the control of finite and infinite state dynamical networks. This investigation includes the real time routing control problem of traffic control appearing in modern automated rapid transit systems. This is a supplement to NSF Grant ENG73-08319.

PERFORMING AGENCY: Yale University, School of Engineering, Engineering & Applied Science

INVESTIGATOR: Morse, AS

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG73-08319 A01

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1975 COMPLETION DATE: 1977 TOTAL FUNDS: \$8,300

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5458)

06 136338

**COMPUTER APPLICATIONS IN CONTROL OF RAILWAY SYSTEMS**

DESCRIPTION: This project encompasses development activity in the application of computers to the control of main line rail traffic, rail classification yards and high density rail and rapid transit interlockings. The general goals of these efforts are improvement of resource utilization, minimization of delays, and greater rail system throughput. Benefits are reduction in energy consumption and increased attractiveness of rail transport as an alternative to more energy intensive forms of transportation. Classification yard control includes automatic computer control of retarder for precise coupling speeds and the switching network for accurate car routing. Computer based management information systems operate in conjunction with the above for maintenance of rolling stock inventory. Development efforts are aimed at improving yard throughput while maintaining or improving coupling speed accuracy. Main line control projects currently underway emphasize centralization and simplification of dispatching and routing functions. Systems deployed to date utilize computer-aided control with the basic decision processes being performed by operating personnel. Development efforts are directed toward higher levels of automatic control encompassing larger areas of controlled territory to yield increased operating efficiency. High-density rail and rapid transit interlockings are ideal candidates for computer control because of their complexity and frequency of traffic. Computerized route finding is currently used in GRS systems, and systems in development will automatically perform many more of the necessary control functions allowing higher traffic densities to be accommodated.

PERFORMING AGENCY: General Railway Signal Company  
 INVESTIGATOR: Means, JB  
 SPONSORING AGENCY: General Railway Signal Company

STATUS: Active NOTICE DATE: Apr. 1976 START DATE: July 1975 COMPLETION DATE: June 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AX 615 1)

06 138529

**TRACK CIRCUIT RESEARCH PROJECT**

The objectives of the Track Circuit Research Project are: 1) to develop a comprehensive file and bibliography on track circuits; 2) to develop analytical and computer models of the track circuit which can be used as research tools; 3) to collect the necessary data in order to validate the track circuit models; 4) to prepare several reports containing the information produced by the project. These reports fall into two separate categories, documentation of the track circuit models and a handbook containing the necessary information to understand track circuits.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hartmann, PW

SPONSORING AGENCY: Association of American Railroads

STATUS: Active NOTICE DATE: July 1976 START DATE: Sept. 1975

ACKNOWLEDGMENT: AAR



07 049659

**HUMAN FACTORS IN RAILROAD OPERATIONS**

This continues a program of research and consultation on human factors in railroad safety in support of FRA regulatory responsibilities involving human performance. Current work includes measurement of air contaminants in the train crew environment, development and evaluation of train handling aids, studies of crew alertness, design of a locomotive cab based on functional requirements, and study of employee motivation.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

INVESTIGATOR: Devoe, D

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Levine, D (Tel (202) 426-1227)

STATUS: Active NOTICE DATE: July 1976

ACKNOWLEDGMENT: FRA

07 058479

**INVESTIGATION OF METHODS FOR IMPROVING RAILROAD CREW VIGILANCE**

The study will consist of two parts: (1) A pilot study to investigate the factors of expectancy or set as a determinant of human performance in a task similar to that of railway signal recognition. (2) An experimental study to test the operational principles forming the basis of currently used methods for maintaining alertness of railway crews.

**REFERENCES:**

Investigation of Methods for Improving Railroad Crews Vigilance, Lawrence Johnson and Assoc., DOT-TSC-1010-76-2, 1976

PERFORMING AGENCY: Johnson (Lawrence) and Associates

INVESTIGATOR: Jones, J (Tel 617-2774200) Lewis, M Shapiro, B

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, RR-509

RESPONSIBLE INDIVIDUAL: Abernethy, C (Tel 617-4942079)

IA TSC-1010

STATUS: Terminated NOTICE DATE: Feb. 1977 START DATE: May 1975 COMPLETION DATE: May 1976 TOTAL FUNDS: \$40,000

ACKNOWLEDGMENT: TRAIS, FRA

07 058845

**DEVELOPMENT OF TECHNIQUES AND DATA FOR EVALUATING RIDE QUALITY**

The contract will require a series of experimental procedures and studies to determine levels of ride motion which would be considered acceptable by the great majority of the potential users of interurban rail systems and of urban bus systems.

PERFORMING AGENCY: Dunlap and Associates, Incorporated, 20/137

INVESTIGATOR: Pepler, RD (Tel (203) 655-3971) Vallerie, L

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

RESPONSIBLE INDIVIDUAL: Sussman, ED

Contract DOT-TSC-1090 (CPFF)

STATUS: Active NOTICE DATE: Dec. 1975 START DATE: July 1975 COMPLETION DATE: June 1976 TOTAL FUNDS: \$99,939

ACKNOWLEDGMENT: TRAIS, Dunlap and Associates, Incorporated

07 129715

**ALCOHOL AND DRUG ABUSE PROGRAMS IN THE RAIL INDUSTRY. PHASE I**

To determine the basic characteristics of employee assistance programs in the railroad industry. Study policies and practices as they relate to funding, staffing, union involvement, discipline, treatment facilities, insurance, coverage, etc. Also examining other domestic transportation industries' methods of dealing with this problem.

PERFORMING AGENCY: Naval Weapons Support Center, Behavioral Sciences Division

INVESTIGATOR: Peay, J

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Collins, DM (Tel (202)426-2608)

Contract AR-64216

STATUS: Completed NOTICE DATE: Feb. 1977 COMPLETION DATE: Nov. 1976

ACKNOWLEDGMENT: FRA

07 148351

**RESEARCH TO PRODUCE OPTIMUM RAILROAD EMPLOYEE TRAINING PROGRAM**

Research to evaluate and to define the need for training in the railroad industry and to recommend to the Federal Railroad Administration the approach and the research pattern that should be used to develop a training package that can be adopted voluntarily by independent railroads and that can be tailored to meet their individual training needs.

PERFORMING AGENCY: Stewart (DA) and Associates, Incorporated

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development

RESPONSIBLE INDIVIDUAL: Vass, T (Tel (202)426-9682)

Contact DOT-FR-75145

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$59,340

ACKNOWLEDGMENT: FRA

07 148352

**ALCOHOL AND DRUG ABUSE PROGRAMS IN THE RAIL INDUSTRY. PHASE II**

To develop techniques and program factors that can be used in the development and improvement of alcohol and drug abuse programs. Included in this development will be the verification cost effective measures, and of program effectiveness evaluation techniques. The end goal is to provide information necessary for every railroad to voluntarily develop an alcohol and drug rehabilitation program that will meet own organizational objectives and needs.

Contract not yet awarded to a performing organization.

SPONSORING AGENCY: Federal Railroad Administration; Transportation Systems Center

STATUS: Proposed NOTICE DATE: Feb. 1977 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: FRA

**08 045291**

**RAILROAD/HIGHWAY GRADE CROSSING SAFETY**

The objective of this contract is to evaluate the effectiveness of new passive device systems to warn drivers of the potential hazard of railroad/highway grade crossings in the interest of greater safety to motorists crossing railroad tracks.

PERFORMING AGENCY: System Development Corporation  
 INVESTIGATOR: Hulbert, S  
 SPONSORING AGENCY: Federal Highway Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Gale, HG (Tel 202-4260743)

Contract FH-11-8141 (CPFF)  
 STATUS: Active NOTICE DATE: Nov. 1975 START DATE: June 1973 TOTAL FUNDS: \$240,000

ACKNOWLEDGMENT: TRAIS

**08 048500**

**CONTROLLED GRADE CROSSING IMPACT TESTS TO ESTABLISH BASELINE DATA ON TRAIN/AUTOMOBILE INTERACTIONS**

It is the purpose of this procurement to establish the baseline data required for the evaluation of the effectiveness of planned locomotive attenuator devices.

PERFORMING AGENCY: Ultrasystems, Incorporated  
 SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Polcari, S (Tel (617)494-2542)

Contract DOT-TSC-700 (CPFF)  
 STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: Jan. 1974 COMPLETION DATE: July 1976 TOTAL FUNDS: \$158,553

ACKNOWLEDGMENT: TRAIS, FRA (PR # TME-0111-GF)

**08 049658**

**RAIL SAFETY/GRADE CROSSINGS PROTECTION**

The program will consist of three major tasks: (1) Development of Application Guidelines for Train 'on board' conspicuity and impact attenuation devices. (2) Innovative System development will study new grade crossing protection concepts. (3) System Analysis will establish inter-administration state and railroad requirements for a data system to accommodate new FRA grade crossing inventory and other data.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research  
 INVESTIGATOR: Coulombre, RE (Tel 617-494-2449)  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Levine, D (Tel 202-426-1227)

STATUS: Active NOTICE DATE: July 1976

ACKNOWLEDGMENT: FRA

**08 058459**

**ON-BOARD LOCOMOTIVE/AUTO IMPACT TEST DEVICE**

Develop a locomotive/auto impact test device to be evaluated in train-strikes-vehicle validation tests at the DOT High Speed Ground Test Site at Pueblo, Colorado. The development is part of TSC Grade Crossing Safety Research and Development sponsored by the Federal Railroad Administration, Office of RD&D, and is directed toward possible improve-

ment in protection for automobile occupants during grade crossing accidents. The attenuator is also intended to decrease the possibility of train derailment due to automobile engine block entrapment under the locomotive.

PERFORMING AGENCY: Minicars, Incorporated  
 SPONSORING AGENCY: Transportation Systems Center, RR-502  
 RESPONSIBLE INDIVIDUAL: Raab, AR (Tel (617) 494-2539)

Contract DOT-TSC-997 (CPFF)  
 STATUS: Active NOTICE DATE: July 1976 START DATE: Apr. 1975 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$122,180

ACKNOWLEDGMENT: TRAIS (RR-502), FRA

**08 135156**

**RAILROAD-HIGHWAY CROSSING SAFETY**

This study is to evaluate new candidate passive grade crossing warning systems at about 70 railroad-highway grade crossing in the 25 participating states. If a new signing and marking system is determined to be more effective than the existing cross-buck system, a change to the UMTCD will be recommended.

PERFORMING AGENCY: Transportation Systems Center  
 INVESTIGATOR: Blood, BE  
 SPONSORING AGENCY: Federal Highway Administration

IA HW-611  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$208,000

ACKNOWLEDGMENT: Federal Highway Administration (041065354)

**08 148325**

**AN EVALUATION OF THE EFFECTIVENESS OF VARIOUS GRADE CROSSING ILLUMINATION STRATEGIES**

The purpose of this research is to determine whether there is a lighting problem at railway/highway grade crossings to which various illumination strategies can be feasible, cost effective solutions. Research that has thus far been directed toward the resolution of the grade crossing problem has been almost exclusively "accident record" based. To this end little is known regarding driver reaction to different grade crossing systems or even to the same systems under varying conditions. More specifically, the research shall: Determine if illumination at grade crossings improves safety, Evaluate the effectiveness of illumination in a range of crossing conditions, Determine the guidelines for the conditions where illumination is most effective, Determine guidelines that optimize the use of illumination to achieve either maximum improvement at reasonable cost or An acceptable level of illumination with minimum cost and/or energy use. Initial efforts shall focus on analyzing the available data regarding illumination at grade crossings that have had a high-accident rate. Scate models, and visual simulators will be used to evaluate the effectiveness of increased illumination.

PERFORMING AGENCY: Kansas State University, Department of Civil Engineering  
 INVESTIGATOR: Russell, ER  
 SPONSORING AGENCY: Department of Transportation  
 RESPONSIBLE INDIVIDUAL: MacKinnon, JH

Contract DOT-OS-60133  
 STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$49,952

ACKNOWLEDGMENT: DOT

09 058267

**METALLURGICAL TESTS AND ANALYSIS FOR HAZARDOUS MATERIAL RAILROAD TANK CARS**

The objectives of this task are to (a) collect a data base on railroad tank car and pressure vessel steels, (b) prepare guidelines for steels to be used in railroad tank car construction, (c) evaluate the elevated temperature performance characteristics of TC-128 steel, and (d) perform a metallurgical evaluation of full scale tanks tested at White Sands Missile Range and tanks involved in actual rail accidents

PERFORMING AGENCY: National Bureau of Standards, Institute for Materials

INVESTIGATOR: Interrante, CG (Tel 301-921-2997)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, D (Tel (202)426-1227)

AR-40008

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1973 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: FRA

09 058484

**WEAR AND FRACTURE CHARACTERISTICS OF CRITICAL COMPONENTS IN GROUND TRANSPORTATION SYSTEMS**

Tasks include: 1-Determination of the properties of steels used in rails and rail couplings. 2-Modification and instrumentation of the existing rail-on-rail test facility in order to study wheel-on-rail wear and rolling contact fatigue. 3-Macrographic and micrographic wear studies on wheel-on-rail wear as a function of load, environment, speed and magnitude of tangential slip. 4-Perform metallurgical and wear analyses of at least 100 field samples of steels used in railroad wheels, rails, and rail couplings. STATUS: Initial investigations of worn rail components were conducted on two rail sections and two wheel sections which had received lifetime wear in the field. Careful optical and scanning electron microscopic studies and hardness tests indicated that an extremely hard wear zone which appears to be brittle and includes many cracks, lies to a depth of about thirty micrometers (30 mm) immediately below the metal surface. This zone has a discernible metallographic structure and has hardness quite in excess of that of martensite steel. In addition, the wear zone appeared to contain excessive amounts of hydrogen, oxygen and nitrogen when compared to the concentrations of these gases in the unworn sections. Conclusions that might be drawn from these observations indicate that although the wear layer has properties similar to that of martensite steel, insufficient heat is generated during rail/wheel contact for the actual information of martensite. It becomes possible that the extreme pressure of rolling contact in the presence of air and/or water has created a reaction product which is exceedingly hard and brittle. The completion and preliminary testing of the laboratory test facility will permit an exact description of the creation and properties of the observed wear zone.

## REFERENCES:

Wear and Fracture Characteristics of Critical Components in Ground Transportation Systems, Keller, DV, Jr, First year Final Report

PERFORMING AGENCY: Syracuse University, Department of Materials Science

INVESTIGATOR: Keller, DV, Jr

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Lauriente, M (Tel 202-4269364)

Contract DOT-OS-50124

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975 COMPLETION DATE: May 1977 TOTAL FUNDS: \$135,045

ACKNOWLEDGMENT: TRAIS, OST

09 104358

**FIBER REINFORCED CONCRETE**

Economical sophisticated mix designs involving different cementitious materials and properties are being developed for steel fiber reinforced concrete. Physical properties are being determined. A study of mixing, handling and placing procedures in construction size quantities is a part of the project as is continued observations of the completed field installations. Anchorage of the fibers to the matrix is being studied. /SIE/

PERFORMING AGENCY: Illinois University, Urbana, Department of Theoretical and Applied Mechanics

INVESTIGATOR: Kesler, CE

SPONSORING AGENCY: United States Steel Corporation

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1972

ACKNOWLEDGMENT: Science Information Exchange (NIL 753 4), Illinois University, Urbana

09 104774

**PROPERTIES AND PERFORMANCE OF CLEAR AND PIGMENTED COATINGS**

An attempt is made to find which types of coatings have the best durability so that advice can be given to users and to determine which basic properties confer durability to assist in development of coatings with improved performance. Both natural and accelerated weathering are used in evaluation studies. Exterior exposures of clear finishes have been completed and a report prepared. Factory-coated sidings are being exposed in comparison with plastic materials. The results of the wood stabilization project are being assessed. The effect of internal stress on coating properties is being studied. /RTAC/ The Swelling of Wood in Polar Organic Solvents, H.E. Ashton, Wood Science, Vol. 6, No. 2, pp 159, 1973. Exterior Exposure Study of Stains and Clear Finishes, H.E. Ashton, Canadian Paint and Finishing, Vol. 48, 2, pp 12 (February 1974). Removal of Solvent From Swollen Wood, H.E. Ashton, Wood Science, Vol. 6, 4, pp 368 (April 1974).

PERFORMING AGENCY: National Research Council of Canada, Division of Building Research

INVESTIGATOR: Ashton, HE (Tel (613)993-1596)

SPONSORING AGENCY: National Research Council of Canada

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1954

ACKNOWLEDGMENT: National Research Council of Canada, Div Bldg Res, Roads and Transportation Association of Canada

09 135139

**SUPER ELASTIC ALLOY SHOCK ABSORBER SYSTEMS**

The objective of the program is to study the application of 'super elastic' alloys such as aluminum bronze to shock absorber systems such as gun mounts or vehicle bumpers. The ability of the material to deform considerably (18 to 20 percent), absorb energy of impact, and return to its original configuration after force of impact is removed, lends itself very well to this type of application. The material absorbs mechanical energy in two stages-by martensitic transformation and by elastic deformation. Either or both modes may be used for deformation energy absorption. These alloys function at any useful temperature, and hence would fill all requirements between say, minus 50 degrees C and 100 degrees C. Specifically, it is proposed to investigate this material in configurations where it will augment or replace overtaxed hydraulic systems in gun mounts. This is not overlooking the possible use of this material in the same configurations in vehicle bumpers or for that matter in any application where impact energy must be absorbed. The effect of temperature and loading rate and the configuration for energy absorption by buckling (long and short columns) as well as compressive blocks will be investigated. Also the fatigue characteristics will be looked into.

PERFORMING AGENCY: Department of the Army, Materials and Mechanics Research Center

INVESTIGATOR: Warnas, A Shepard, LA

SPONSORING AGENCY: Department of the Army, Department of Defense, DA0F4717

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 64717)

09 135495

**EVALUATION OF SHOTCRETE THEORY AND TECHNIQUES**

Purpose of study/investigation: To evaluate shotcrete as a construction material for application to Corps project, i.e., to determine correct sampling techniques, pertinent physical properties, problem areas, and limitations of usage. Approach or plan: A summary of what is known about (1) shotcrete from various users, (2) available equipment, and (3) laboratory tests will be

made. Both fine and coarse aggregate mixtures will be utilized using the two types of shotcreting equipment (wet and dry). Basic properties, procedures, limitation, and applications will be studied. Progress to date: (1) To date. Laboratory work, approximately 80 percent complete, has been conducted on four types of shotcrete: fine and coarse dry process and fine and coarse wet process shotcrete. Information has been developed on the compressive, tensile, and shear strength of each type of shotcrete. In addition, data have been secured on bond of old shotcrete to fresh shotcrete, permeability and freeze-thaw resistance, and bond to reinforcing steel. (2) Anticipated FY 74. The remaining data on tests mentioned above will be secured, tabulated, and analyzed. The field application phase will be planned and initiated.

PERFORMING AGENCY: Department of the Army, Concrete Laboratory  
 INVESTIGATOR: Mather, B  
 SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 367)

09 136074

#### SHEAR TRANSFER IN REINFORCED CONCRETE

The objective of this continuing research is to extend the study of shear transfer across a plane in reinforced concrete as follows: (1) To study the influence of a normal tension stress across the plane, on the shear transfer strength of reinforced concrete subject to cyclically reversing load. (2) To study the transfer of shear across the interface between concrete cast at different times (and between concrete and mortar) under the action of both single direction and cyclically reversing loads. (3) To study the influence of reinforcing bar diameter on shear transfer behavior, with particular reference to the possible limitations on the use of large diameter reinforcing bars as shear transfer reinforcement. In each instance the study will be directed toward the development of design recommendations for shear transfer in reinforced concrete under the conditions involved, through the attainment of a better understanding of the mechanics of behavior.

#### REFERENCES:

Shear Transfer in Reinforced Concrete with Moment or Tension Acting Across the Shear Plane, Mattock, AH; Johal; Chow, Journal of the Prestressed Concrete Institute, Vol. 20, No. 4, July 1975

Shear Transfer in Lightweight Reinforced Concrete Mattock, AH; Li; Wang, Journal of the Prestressed Concrete Institute, Vol. 21, No. 1, Jan. 1976

PERFORMING AGENCY: Washington University, Seattle, Department of Civil Engineering, 61-6808

INVESTIGATOR: Mattock, AH (Tel (206)543-6503)

SPONSORING AGENCY: National Science Foundation, Division of Engineering

Contract NSF-ENG74-21131

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$93,400

ACKNOWLEDGMENT: Science Information Exchange (GSE 3608 2), Washington University, Seattle

09 136093

#### PROTECTION OF WOOD IN USE

OBJECTIVE: Modify existing procedures and develop new ones for imparting a high resistance to wood against biological degradation and harmful weathering action, with special attention to minimizing objectionable environmental side effects. APPROACH: Develop new concepts and procedures for preserving wood such as chemical modification of the polysaccharides in wood. Investigate the possibility of increasing the permeability of wood by chemical or microbiological methods. Develop an economical preservative treatment for wood piles to protect against all species of borers by a combination of creosote and inorganic salts. Determine the practicality of diffusion-type treatments for various wood species by studying the effectiveness of various combinations of salts and pretreating steps. Develop improved water-repellent-preservative finishes by increasing the permanence of fungicidal chemicals used in such finishes. Improve the permanence of coatings by modifying the surface of wood as an acceptor of finishes. Develop effective preservatives for controlling degradation of pulp chips during outside storage.

PERFORMING AGENCY: Wisconsin University, Madison, Forest Products Laboratory

INVESTIGATOR: Hajny, GJ

SPONSORING AGENCY: Forest Products Laboratory, 0040038 FPL3212

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 40038 2)

09 138557

#### IMPROVED INSPECTION, DETECTION AND TESTING RESEARCH

This Division will plan, implement, sponsor and provide overall technical control and direction to development programs in the area of improved inspection, detection and testing techniques and equipment designed to improve railroad safety. The Division is the FRA contact point for all such programs and will provide for interchange of technological information among interested parties within the department, other government agencies and industry. Programs include Safety Life-Cycle Testing, Vehicle Inspection, Track Inspection and Testing, and Automated Inspection System Development.

For the subprograms see RRIS Nos. 03A 138558, 03A 138559, 01A 138560 and 01A 138561.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Winn, JB (Tel (202)426-1682)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: FRA

09 138558

#### SAFETY LIFE-CYCLE TESTING

Develops, recommends, promotes and implements, a safety life-cycle testing and evaluation program. Provides facilities, equipment and technology necessary to detect and evaluate the cause and effect of rolling stock and track deterioration/failure thru the accumulation of Life-Cycle testing, data and experience.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Winn, JB (Tel (202) 426-1682)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1977

ACKNOWLEDGMENT: FRA

09 138571

#### EFFECTS OF MICROSTRUCTURE VARIABLES ON THE FATIGUE BEHAVIOR OF RAIL STEELS

This investigation of the properties of rail and wheel steels has indicated that non-metallic inclusions do shorten the time required to initiate fatigue cracks but do not affect the subsequent rate of crack growth and also show that the tension-compression loading ratio affects the rate of crack growth.

PERFORMING AGENCY: California University, Los Angeles

SPONSORING AGENCY: Association of American Railroads Technical Center

RESPONSIBLE INDIVIDUAL: Stone, DH

STATUS: Active NOTICE DATE: July 1976

09 139164

#### RAIL MATERIAL FAILURE PROPERTIES AND BEHAVIOR CHARACTERIZATION

This program is structured along three lines--experiments, analysis and metallography. The crack growth properties of U.S. rail population are determined. The importance of metallurgical factors (chemical composition, microstructure and production methods) are assessed. A fractographic reference standard for service failure analysis will be compiled. A failure model for prediction of rail failures, when small flaws are discovered, will

be established. The model will be used to evaluate possible metallurgical changes for rail improvement.

PERFORMING AGENCY: Battelle Columbus Laboratories  
 INVESTIGATOR: Broek, D (Tel (614) 424-6424)  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Steele, RK (Tel (617) 494-2002)

Contract DOT-TSC-1076  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: July 1977 TOTAL FUNDS: \$395,738

ACKNOWLEDGMENT: FRA

**09 148319**  
**SEMINAR ON POLYMERIC MATERIALS AND THEIR USE IN TRANSPORTATION**

A seminar will be held to acquaint individuals responsible for using and maintaining transportation systems utilizing polymeric materials (plastics) with knowledge about what materials are available, how and where such materials may be used, and what their limitations are. The effort will initially focus on surveying materials experts in industry and government in order to determine the present state-of-the-art. A seminar will be held in early 1977 to present findings on the applications of plastics in transportation, and the possibilities of future plastics use. The benefits of such a seminar shall be related to increased safety and expected lifespan and to decreased construction/operating costs.

PERFORMING AGENCY: Polytechnic Institute of New York  
 INVESTIGATOR: Pearce, EM  
 SPONSORING AGENCY: Office of the Secretary of Transportation  
 RESPONSIBLE INDIVIDUAL: McGuire, CW

Contract DOT-OS-60139

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$29,545

ACKNOWLEDGMENT: DOT

**09 148320**  
**FLAMMABILITY STUDIES AND TOXICOLOGICAL EVALUATION OF MATERIALS USED IN TRANSPORTATION VEHICLES**

The increasing use of plastics and other man-made materials in various vehicular interiors poses new flammability, toxicity, and smoke generation hazards. Various government agencies and manufacturers have been considering the establishment of performance standards for materials used in interior finishes and several new materials have been developed in anticipation of such standards. This research describes a comprehensive approach to the general materials testing problem, leading to the establishment of design criteria and standards which shall result in fire-safe vehicles for the future. A complete study shall be made of the burning characteristics of various interior materials ignited inside simulated enclosures. Test conditions shall be varied to investigate the effects of the following factors:

- 1) Flammability ratings of the materials as obtained from laboratory tests.
- 2) Ventilation rates as provided by different size openings into the enclosure.
- 3) Partitioning of the enclosure by use of a fire barrier curtain.
- 4) Discharge of toxic gases into the interior space.

A comparison of the flame resistant properties offered by different materials will be conducted. Results of the research will be used to propose new flammability test standards and specific recommendations for increasing vehicle-interior fire protection will be offered.

PERFORMING AGENCY: Rice University, Rice Center for Community Design and Research  
 INVESTIGATOR: Margrave, JL  
 SPONSORING AGENCY: Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Bolger, PH

Contract DOT-OS-60149  
 STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$125,000

ACKNOWLEDGMENT: DOT

10 058132

**PROGRAM FOR LOCOMOTIVE AND MARINE DIESEL ENGINE PERFORMANCE AND EMISSIONS**

The first phase will focus on detailed problem definition including a survey and identification of existing methods to reduce emissions of white and black smoke and nitrogen oxides from and improve the thermal efficiency measurement procedures applicable to these engines; a study of engine duty cycles to establish representative test scenarios and an evaluation of how the quality of ingested air, wear and engine maintenance influence emission levels and fuel consumption. The second phase of this program will consist of laboratory and infield evaluative testing of changes and modifications selected by the government from those recommended in Phase I.

PERFORMING AGENCY: Southwest Research Institute  
SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, CG-407

Contract TSC-920 (CPFF)  
STATUS: Active NOTICE DATE: Aug. 1975 START DATE: Nov. 1974 COMPLETION DATE: July 1976 TOTAL FUNDS: \$247,117

ACKNOWLEDGMENT: TRAIS (CG-407)

10 058462

**ASSESSMENT OF RAILROAD LOCOMOTIVE NOISE**

To date, most available data on railroad noise has been of the opportunity type with little emphasis on controlled parametric testing. The intent of this project is to determine under controlled locomotive operating conditions overall and major source component noise levels, the directivity and the propagation efficiency (level vs. distance) of locomotive noise, and the proper measuring techniques required to accurately assess overall and component noise levels from a typical locomotive. An interim report is being prepared.

Co-sponsorship is from FRA, DOT and OST, DOT.

PERFORMING AGENCY: Bolt, Beranek and Newman, Incorporated  
INVESTIGATOR: Remington, PJ (Tel (617)491-1850) Michale, R  
SPONSORING AGENCY: Transportation Systems Center, OS-507  
RESPONSIBLE INDIVIDUAL: Mason, RL (Tel (617)494-2443)

Contract DOT-TSC-1016 (CPFF)  
STATUS: Active NOTICE DATE: July 1976 START DATE: Apr. 1975 COMPLETION DATE: July 1977 TOTAL FUNDS: \$49,017

ACKNOWLEDGMENT: TRAIS (OS-507), TSC

10 058621

**RAILROAD RETARDER NOISE REDUCTION**

A cooperative effort is planned between DOT (TSC), and the BN to collect, assess and disseminate information regarding the character of the noise environment associated with the operation of active retarders in railroad classification (hump) yards and also, to present in useful form information as how to reduce retarder noise locally and to surrounding communities by the use of noise barriers. Information will be obtained by a measurement, barrier construction and evaluation program to be conducted at the Northtown freight classification yard of the Burlington Northern Railroad, Fridley, Minnesota.

PERFORMING AGENCY: Burlington Northern, Incorporated  
SPONSORING AGENCY: Transportation Systems Center, OS-507  
RESPONSIBLE INDIVIDUAL: Rickley, EJ (Tel (617)494-2372)

Contract DOT-TSC-1035 (CPFF)  
STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975 TOTAL FUNDS: \$69,150

ACKNOWLEDGMENT: TRAIS (OS-507), FRA

10 058632

**MEASUREMENT OF TOXIC SUBSTANCES IN TRAIN CREW ENVIRONMENTS**

Perform measurements, at a minimum, of the following contaminants in the train crew breathing environment: Nitric oxide (NO), Nitrogen dioxide (NO<sub>2</sub>), Carbon monoxide (CO), Total hydrocarbon (THC), Aldehydes, Ozone (O<sub>3</sub>), and Particulates. Analyze all data and correlate these data with salient features of engine performance, terrain, meteorological conditions etc.

PERFORMING AGENCY: Scott Environmental Technology, Incorporated  
INVESTIGATOR: Souza, A  
SPONSORING AGENCY: Transportation Systems Center, RR-509  
RESPONSIBLE INDIVIDUAL: Hobbs, J

Contract TSC-1071 (CPFF)  
STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 TOTAL FUNDS: \$37,114

ACKNOWLEDGMENT: TRAIS (RR-509), FRA

10 058675

**DEVELOPMENT OF ENGINEERING DATA ON IN-SERVICE PERFORMANCE AND COSTS OF METHODS FOR CONTROL OF URBAN RAIL SYSTEM NOISE**

The objective is (1) to develop definitive engineering data on long term costs and performance of four noise control techniques, and (2) to organize and present the data to permit engineering estimates of costs and performance of the techniques on any urban rail transit system in the United States. The techniques are: (a) use of resilient wheels on transit cars, (b) use of damped wheels, (c) use of wheel truing equipment to remove wheel flats and reduce wheel roughness, and (d) use of rail grinding equipment to reduce rail roughness.

PERFORMING AGENCY: De Leuw, Cather and Company  
SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, UM-504

Contract TSC-1053 (CPFF)  
STATUS: Active NOTICE DATE: July 1975 START DATE: June 1975 TOTAL FUNDS: \$379,073

ACKNOWLEDGMENT: TRAIS (UM-504)

10 099085

**ENVIRONMENTAL NOISE MEASUREMENT**

Federal noise control legislation has resulted in an increased need for valid procedures for the measurement of environmental noise. Through the development of measurement methodologies for tire noise, truck and air compressor certification tests; the establishment of data bases in the areas of surface transportation; machinery and community noise; and the development of specialized measurement and analysis instrumentation, NBS programs have contributed to satisfying this need. Future work will build upon this base and extend the understanding of generation mechanisms of various environmental noise sources as the initial step in developing noise control technology and appropriate measurement procedures. Objective: To provide government and industry with the technical basis for noise abatement and control through the development of measurements standards, development of specialized instrumentation and conduct of research in support of accurate, reliable noise measurements.

PERFORMING AGENCY: National Bureau of Standards, Department of Commerce  
INVESTIGATOR: Blomquist, DS  
SPONSORING AGENCY: National Bureau of Standards, Department of Commerce, 2130150

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: June 1977 TOTAL FUNDS: \$223,000

ACKNOWLEDGMENT: Science Information Exchange (ZBA 5729 2)

10 099381

**RESEARCH ON URBAN TRANSPORT PLANNING METHODS AND ENVIRONMENTAL IMPACTS**

The objective is to make the transportation planning methodology wider in scope in defining the costs and impacts of investments. Land use patterns are determined simultaneously with the transportation system and the ambient air quality is a function of the system's configuration, level of service, and modal distribution of demand. The planning techniques were improved to include alterations to existing ambient air quality resulting from transportation network changes. The research is being conducted in several phases. The first has been a model for forecasting emissions. Emissions from stationary sources are derived from patterns of land use and an inventory of point sources. Then a diffusion model to obtain macro level ambient air quality forecasts for zones will be developed. Both models have been

calibrated for the Boston and Los Angeles areas and are applicable to other urban areas. Then, land use relationships are developed through econometric analysis of transportation and land use patterns (e.g. auto ownership and mode choice as a function of socioeconomic-demographic characteristics of households). The final product will be a consistent planning model incorporating land use patterns as an endogenous variable, and predicting air quality.

PERFORMING AGENCY: Harvard University, Department of Economics  
 INVESTIGATOR: Ingram, GK  
 SPONSORING AGENCY: Office of the Secretary of Transportation, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Cooper, NL

STATUS: Active NOTICE DATE: Aug. 1976 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: DOT

#### 10 100807

##### ANALYSIS OF A NEW APPROACH FOR ENVIRONMENTAL POLICY EVALUATION

This project will study environmental policy issues related to six problem areas, in order to attempt the development of general methods for using pareto analysis as a means of evaluation the political feasibility of various decisions. These problems are: (1) control of urban air pollution-stationary sources; (2) control of air pollution-mobile sources; (3) environmental aspects of electric power plant siting; (4) residual management in land use planning; (5) control of urban fires; (6) urban solid waste management. /SIE/

PERFORMING AGENCY: Harvard University, School of Engineering, Engineering & Applied Physics  
 INVESTIGATOR: Thomas, HA  
 SPONSORING AGENCY: National Science Foundation, Division of Engineering Systems and Research, GI-35117A #3

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 TOTAL FUNDS: \$303,100

ACKNOWLEDGMENT: Science Information Exchange (GSQ 331 2)

#### 10 130953

##### ANALYSIS OF A NEW APPROACH FOR ENVIRONMENTAL POLICY EVALUATION

This project will complete analysis of environmental policy issues related to five problem areas, for the purpose of developing the general methods and techniques for using Pareto Analysis as a means of evaluating the political feasibility of various decisions. The problem areas are: 1) Control of air pollution-stationary sources; 2) Control of air pollution-mobile sources; 3) Environmental aspects of electric power plant siting; 4) Residuals management in land-use planning; and 5) Urban solid waste management. This final phase also focuses on producing a monograph that provides an introduction to Pareto Environmental Analysis (PEA); practical applications; the development of PEA theory; and conclusions in which PEA is evaluated and advantages and disadvantages are discussed. The PEA method which is being developed formalizes the decision-making process. It involves a method for identifying interest groups and quantifying their evaluation of alternatives. The tool is intended to improve decisions and make decision technicians far more useful.

PERFORMING AGENCY: Harvard University, School of Engineering, Engineering & Applied Physics  
 INVESTIGATOR: Thomas, HA  
 SPONSORING AGENCY: National Science Foundation, Division of Advanced Environmental Research & Technology, AEN72-03523 A04

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec. 1975 TOTAL FUNDS: \$212,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 331 3)

#### 10 135661

##### CHARACTERIZATION AND CONTROL OF AIR POLLUTANT EMISSIONS FROM COMBUSTION OF FUELS

Description: The overall objectives of this research project are to determine the characteristic air pollutant emission types and levels from: (1) Combustion

of current fuels in use, and (2) Combustion of new fuels that are projected for major use in the future. This project will evaluate the air pollutant control potential for a wide range of liquid, gaseous, and solid fuels. All of the investigation will be performed under controlled laboratory conditions and will provide information that will establish the air pollutant emission picture of fuel in different combustion systems. A series of fuels will be tested for emission characteristics over a wide range of conditions with appropriate combustors. This series will include heavy oils, desulfurized heavy oils, distillate oils, crude oil, methanol, low and high BTU gases, and coal. A survey of fuels will be made, concentrating on obtaining information (cost, composition, etc.) about fuels in present use and new "clean" fuels that may become major energy resources as new air pollution control regulations are passed.

PERFORMING AGENCY: National Environmental Research Center, Environmental Protection Agency  
 INVESTIGATOR: Martin, GB  
 SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development, 21 ADG 46

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1972 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AO 20684 2)

#### 10 135753

##### POLYNUCLEAR AROMATIC HYDROCARBON EMISSIONS FROM HEAVY DUTY DIESEL ENGINES

This project has as its objective the determination of the polynuclear aromatic hydrocarbon content of diesel fuels and diesel engine exhaust gases. Several different types of engines and individual operating modes will be examined. The approach to be taken involves first establishing that a satisfactory sampling procedure has been developed. Then a survey of some 20 diesel fuels will be made to establish typical levels of PNA in commercial products. From this survey a typical baseline fuel will be selected and used in seven (7) different types of heavy duty diesel engines. Exhaust gases from the Federal exhaust hydrocarbons emission cycle and also from the Federal smoke cycle will be separately analyzed. Finally, on one engine, the exhaust from 13 individual modes will be examined. Initial plans are to develop the sampling procedure and validate its use.

PERFORMING AGENCY: Gulf Research and Development Company  
 INVESTIGATOR: Stindt, RS  
 SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development, 68-01-2116 72P21626

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AO 21626 1)

#### 10 136145

##### MASS TRANSIT SYSTEMS STUDY

EPA agrees to join in a cooperative interagency contract for a policy study on mass transit systems. The other agencies involved are OAWP, SASD, Land Use Planning Branch, and the Office of the Assistant for Environment and Urban Systems, Department of Transportation. The contractor would review, report, and advise on information on traffic congestion, air pollution and energy requirements associated with urban transportation, project the results of current trends in these areas, assuming no change in outside influences, and evaluate the consequences of continuation of the present Federal goals for urban area mass transportation and air quality. The contractor would also determine the air pollution implications of various forms of mass transit now under consideration by UMTA, including magnetic levitation, tracked air cushion and over-the-water air cushion vehicles, hydrofoil, personalized rapid transit, dual-mode vehicles, dial-a-ride, and increased use of taxis.

PERFORMING AGENCY: Urban Mass Transportation Administration  
 INVESTIGATOR: Winkler, F  
 SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development, IAG 107 72P21175

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AO 21175)



10 138380

**LATERAL VERTICAL AND VIBRATIONAL PRESSURES IN BULK POTATOES**

Determine pressures exerted by bulk stored potatoes and how these pressures are influenced by size, shape of tubers, friction, temperatures, humidity. Determine effect of vibrational pressure caused by trains passing on tracks adjacent to stored potatoes. Install in commercial size storage, "Pressure panels." Monitor pressures during filling, emptying, "cool-down," "warm-up" humidity cycles, length of time stored. Use russet skin, smooth skin, round shape, flat shape, mostly larger than 2-1/2 inches—mostly smaller and 2-1/2 inches. Thirteen vertical load cells and thirteen horizontal load cells (hermetically sealed) were installed at the end of a 24 ft. wide by 19 ft. high by 80 ft. long prototype bin. Norchip variety potatoes were piled 18 ft. deep. Unit lateral pressures reached initial peak value near floor within 3 days after bin filling. These then decreased for 2 to 3 weeks before increasing again. Second series of peak values occurred 2 feet above initial peak unit lateral pressure location. Sawtooth lateral pressure pattern developed with time. Vertical (floor) unit pressures continued to increase with time. Preliminary analysis of data indicate ARS-52-32 data can not be extrapolated to wide shallow bins. Preliminary data indicate definite vibration effects on pressure due to trains.

PERFORMING AGENCY: Agricultural Research Service, Department of Agriculture, 3506-15630-006

INVESTIGATOR: Yaeger, EC Schaper, LA Shaw, R

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1974 COMPLETION DATE: Aug. 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0041318)

10 138534

**NOISE ABATEMENT**

Identified as a major systems problem for transit authorities, this program has as its objective the reduction of noise and vibration on urban rail transit systems. Problem areas have been identified and the noise climate on operating authorities has been appraised. Tests and evaluation of available abatement hardware are to be made. New technology is to be developed. A handbook on noise and vibration control is to be produced.

PERFORMING AGENCY: Transportation Systems Center, Department of Transportation

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Spencer, PR (Tel (202) 426-0090)

Contract UM-604

STATUS: Active NOTICE DATE: July 1976 START DATE: 1971 COMPLETION DATE: June 1979 TOTAL FUNDS: \$3,500,000

ACKNOWLEDGMENT: UMTA

10 147738

**UTILIZING ENVIRONMENTAL ASSESSMENTS IN PUBLIC WORKS PLANNING, ORGANIZATIONAL STRUCTURES AND PROCESSES**

The research consists of an investigation of the way in which environmental assessments are conducted, utilized and reviewed in a variety of water resources and transportation planning offices with a purpose of streamlining and improving the process of environmental assessment. The investigation will describe and analyze (a) how different offices are organized to conduct the EIS process; and (b) the timing, methods and procedures used in bringing the information generated by the EIS process to bear on decision making. The research also seeks to identify obstacles to the timely and appropriate consideration of environmental factors with a purpose of defining alternative ways of dealing with such obstacles. The research plan is built around the use of indepth interviews with planners and environmental specialists in a variety of contexts. The planning offices investigated are selected from among Federal water resources agencies and Federal and state transportation agencies in a number of different geographical areas. The research will follow a systematic research design so that the results will be expected to go beyond anecdotal, ungeneralizable conclusions and develop insights about ways to improve environmental assessments conducted in government agencies. An oversight committee consisting of representatives from various "user groups" will guide the course of the research.

PERFORMING AGENCY: Stanford University, School of Engineering

INVESTIGATOR: Ortolano, L

SPONSORING AGENCY: National Science Foundation, Division of Expl Research and System Analysis

STATUS: Active NOTICE DATE: June 1976 START DATE: May 1976 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$75,100

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BV 880)

10 147740

**COAL PARTICULATE SOURCES AND DISPERSION IN DULUTH-SUPERIOR HARBOR**

The purpose of the proposed investigation is to determine the long-range influence of a coal loading facility on a Great Lakes harbor in terms of transport of coal leachates and particulate matter, using physical and chemical measurements and application of numerical modeling for water quality to the Duluth-Superior Harbor. The proposed work entails development of a numerical model for water quality in the Duluth-Superior Harbor. The distribution of the pollutant sources will be assessed through sampling measurements with the aid of remote sensing. The results will be applied in numerical modeling to determine the dispersion of leachates and coal particulates in the Harbor, with particular emphasis on secondary pollution sources arising from deposition and resuspension of coal material.

PERFORMING AGENCY: Minnesota University, Duluth, School of Letters and Science

INVESTIGATOR: Sydor, M Stortz, K

SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development, R803952 02

STATUS: Active NOTICE DATE: June 1976 START DATE: July 1975 COMPLETION DATE: June 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GMA 2758)

10 148323

**TASSIM: A TRANSPORTATION AND AIR SHED SIMULATION MODEL**

The research objective is to improve the capability to predict the environmental and transportation consequences of metropolitan transportation policies. The research has developed TASSIM, a computer simulation model that is capable of predicting air quality levels as a function of transportation related pollutants. TASSIM contains three submodels: an urban transportation model, vehicle emission factors, and an air diffusion model. An underlying hypothesis of this model is that the air quality is a function of the transportation system's configuration, level of service and distribution of demand. The model has been extended and improved, documented for other users, and applied to evaluate numerous transportation control and land use policies in urban areas. In addition, econometric analyses relating metropolitan area transportation and land use patterns have been performed as groundwork for developing a more complete representation of land use/transport interactions in policy evaluation models.

**REFERENCES:**

TASSIM: A Transportation and Air ShED Simulation Model, Case Study of the Boston Region, Ingram, GK; Fauth, GR; Kroch, EA, Harvard University, Cambridge, Mass., Volume 1, No Date, PB-232933/AS

TASSIM: A Transportation and Air Shed Simulation Model, Program User's Guide, Ingram, GK; Fauth, GR; Kroch, EA, Harvard University, Cambridge, Mass.

PERFORMING AGENCY: Harvard University, Department of Economics

INVESTIGATOR: Ingram, GK

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Cooper, NL

Contract DOT-OS-30099

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$176,994

ACKNOWLEDGMENT: DOT

10 148341

**WHEEL/RAIL INTERACTION SIMULATOR**

Design of a machine which simulates interaction of rails and wheels for purposes of noise measurements.

PERFORMING AGENCY: Ontario Ministry of Transportation & Communic,  
Can

INVESTIGATOR: Curmi, RA (Tel (416)248-3771)

SPONSORING AGENCY: Ontario Ministry of Transportation & Communic,  
Can

RESPONSIBLE INDIVIDUAL: Curmi, RA (Tel (416)248-3771)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec.  
1976 COMPLETION DATE: June 1978

ACKNOWLEDGMENT: Ontario Ministry of Transportation & Communic, Can

**10 148349**

**ADDITIONAL RAIL RAPID TRANSIT NOISE STUDIES BASED  
ON THE NEW YORK CITY**

Cost Data and Cost Studies work will aim toward improved quantification of the cost of directly noise-related treatment items; more complete identification of cost items such as power consumed by extra weight and the excess equipment needs; systematic study of the cost, operation, cost

effectiveness and operational implications of various treatments including traceability of manpower utilization, equipment out of service, financial and other available sources. Degradation of Improvements will be undertaken with the cooperation of the NYCTA to maintenance records of the selected cars will be accomplished during the study period. Car Maintenance Records on selected cars will be used to analyze data for correlations of car status with noise characteristics. Included will be consideration of the time since last major overhaul and time since certain key repairs.

PERFORMING AGENCY: Polytechnic Institute of New York

INVESTIGATOR: McShane, W (Tel (212)643-5272) Slutsky, S

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Hughes, PG (Tel (202)426-0080)

Contract NY-11-0002

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar.

1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$62,304

ACKNOWLEDGMENT: UMTA

11 038789

**TRACKED LEVITATED RESEARCH VEHICLE**

The initial test phase of the TLRV utilized its aeropropulsion mode in which thrust was derived from the exhaust of the vehicle's three turbofan engines used for cushion air supply. Operations were conducted up to 91 mph, and included tests of the vehicle's ride quality and performance. During the last year of testing, the TLRV was used as a test bed to support research in electric propulsion. The project was terminated in June 1976.

PERFORMING AGENCY: Grumman Aerospace Corporation  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Lampros, AF (Tel 202-4269564)

Contract DOT-FR-30041 (CPFF)

STATUS: Terminated NOTICE DATE: Feb. 1977 START DATE: Feb. 1973 TOTAL FUNDS: \$2,806,716

ACKNOWLEDGMENT: TRAIS (PR # 72-158)

11 058273

**EVALUATION OF ELECTRICAL PROPULSION BY MEANS OF IRON-CORED SYNCHRONOUSLY OPERATING LINEAR MOTORS**

This project constitutes the initial research phase of synchronous linear motors for transportation. The motors considered are restricted to those having both the excitation and armature windings on the same structure, i.e., on board the vehicle. The primary objectives are to determine the feasibility of two types (the homopolar inductor and the claw-pole) for propulsion of railroad vehicles, and to establish a basis for further exploratory R&D on a test wheel. The aim is to develop an alternate to the present linear induction motor, with the potential for higher efficiency and power factor, larger clearances with the reaction rail, and useful attraction and guidance forces to inhibit vehicle derailment.

PERFORMING AGENCY: Polytechnic Institute of New York  
INVESTIGATOR: Levi, E (Tel 212-643-4486)  
SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
RESPONSIBLE INDIVIDUAL: Guarino, M (Tel 202-426-9564)

STATUS: Active NOTICE DATE: July 1975 START DATE: Apr. 1973 COMPLETION DATE: June 1976

ACKNOWLEDGMENT: FRA

11 058355

**DYNAMIC INTERACTIONS AND OPTIMAL DESIGN OF PRT VEHICLES**

Analytical models have been developed for the examination of both vehicle performance and guideway behavior. A simulation method has been used to study the dynamics of vehicle heave and roll motions on horizontally curved guideways. In addition, the parameter optimization program is being used to develop guidelines for optimized vehicle/guideway designs. Integration of the results of these activities will be carried out to verify that under realistic operating conditions, the vertical, lateral and twisting accelerations of vehicles and occupants of optimized AGT systems will satisfy ride comfort criteria. STATUS: The development of computer programs for the simulation of vehicles traversing a class of curved guideways is now complete. The performance of designs optimized for straight sections are being evaluated on curved sections. The objective is to meet ride quality constraints on both straight and curved sections. Design of a banked transition section between straight and curved sections is in progress. Initial results show the design is sensitive to the maximum tolerable levels of transient lateral acceleration. Design and comfort optimization algorithms have been developed for elevated straight guideways using preliminary cost functions. The optimization efforts are being expanded to include possible guideway misalignments, guideway roughness, AGT vehicle suspension damping, and the possibility of multiple vehicles on a single guideway segment. The study of elastic guideway dynamics is also being expanded. Lateral and roll motions are being included in the vehicle/guideway model, and straight segment models are being joined with curved guideway models to more realistically describe total system behavior.

## REFERENCES:

Stability Analysis of Constant Speed Transit Vehicles on Straight, Horizontal, Fixed Guideways, Olusola, O; Likins, P, Vehicle System Dynamics, Amsterdam, Netherlands, Dec. 1975

Dynamic Interactions of Vehicles and Curved, Elastic Guideways, Barry,

K; Olusola, O; Graham, M; Likins, P, Presented at ASME Winter Meeting, 1975

PERFORMING AGENCY: California University, Los Angeles  
INVESTIGATOR: Nelson, RB  
SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
RESPONSIBLE INDIVIDUAL: Ravera, RJ

Contract DOT-OS-40080

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1974 COMPLETION DATE: May 1977 TOTAL FUNDS: \$120,506

ACKNOWLEDGMENT: Office of Systems Development and Technology

11 058375

**MORGANTOWN PERSONAL RAPID TRANSIT SYSTEM IMPACT EVALUATION**

The study will consist of the pre-PRT stage prior to the passenger operation of the system and the post-PRT stage, after the system has been placed into revenue service, with the following objectives: a. to measure the service and accessibility of the system, b. to determine the nature of system patronage, c. to describe the operational costs and revenues of the system, d. to examine the attitudes of the people in the community toward the system, e. to measure the impact of PRT upon: travel and traffic, the economy, the society, and the environment in the PRT corridor, f. to create a methodology for extrapolation of the results. The pre-PRT stage has been completed. The Post-PRT stage is scheduled to occur during cy 1977.

PRT Impact Study, Pre-PRT Phase. March 1976, Volume 1- Travel Analysis, SEG Elias; Volume 2-Data Collection Methodology and Coding Manual; Volume 3-Frequency Tabulations from Transportation Related Surveys, CN Redwine.

PERFORMING AGENCY: West Virginia University, WV-03-0006  
INVESTIGATOR: Elias, SEG (Tel (304)293-5131)  
SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, UM-639  
RESPONSIBLE INDIVIDUAL: Stearns, MD (Tel (617)494-2796)

Contract DOT-TSC-985

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1975 TOTAL FUNDS: \$110,097

ACKNOWLEDGMENT: UMTA, West Virginia University

11 058378

**LONGITUDINAL CONTROL SYSTEM DESIGN SUMMARY**

Provide a report documenting the Morgantown Phase IB LCS design effort. The report shall contain the following elements: a. General System Description--Provide a general description of the longitudinal control system elements and operation of the overall system. b. Phase IB Design Task Requirements--Describe the requirements on the system and the resulting design, analysis and development test program undertaken to meet these requirements. c. Analysis and Test Results--Describe the major analysis and test results obtained, emphasizing the major problem areas encountered and the solutions to these problems. d. Analytical model which provides a detailed description of design effort. e. Potential system improvements: Identify potential improvements to the system on the basis of experience with the Morgantown system, which are logical candidates for future research and development.

PERFORMING AGENCY: Boeing Company, Aerospace Group  
SPONSORING AGENCY: Transportation Systems Center, UM-533  
RESPONSIBLE INDIVIDUAL: Patt, NG (Tel (617)494-2237)

Contract DOT-TSC-994 (CPFF)

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: Mar. 1975 TOTAL FUNDS: \$21,000

11 058512

**RIDE QUALITY STUDIES ON GROUND-BASED TRANSPORTATION SYSTEMS**

Objectives are: (1) To measure and record sufficient acceleration and vibration data to provide a description of the characteristic ride motions of the Dallas/Fort Worth (DFW) Airport AIRTRANS vehicles and to allow

the development of mathematical models of the vehicles and the validation of these models; (2) To develop vehicle dynamics models for the AIR-TRANS vehicle(s) and to study the effects of the steering arm and power collector motor inputs on the vehicles' dynamic behaviors; and (3) To identify the analysis techniques and to prepare the computer programs required for the correlation of the measured vehicle ride motions and the subjective responses of passengers.

PERFORMING AGENCY: Texas University, Department of Mechanical Engineering

INVESTIGATOR: Healey, AJ

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Sussman, ED

Contract DOT-OS-50126 (CS)

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: June 1975 COMPLETION DATE: June 1976 TOTAL FUNDS: \$49,870

ACKNOWLEDGMENT: TRAIS (PUR-50185), OST

11 099412

#### LINEAR INDUCTION MOTOR COMPARATIVE ANALYSIS

To carry out theoretical and experimental research into linear inductions Motors (LIM's). The objectives are: 1) To review, understand, and quantify the basic differences between the predictive models of a LIM developed by various researchers worldwide with particular emphasis on the influence of compensating windings to improve motor performance. 2) To study and quantify end effects for single and double sided LIM's. 3) To investigate and quantify through experimentation the effects of compensating windings with respect to energy consumption, efficiency and economic viability when used in a practical vehicle configuration. 4) To formulate a predictive analytical model based upon the world knowledge to date, and the experience gained during this work, and then verify the model experimentally.

PERFORMING AGENCY: Centre de Recherches des Transports, Montreal University

INVESTIGATOR: Mukhedkar, D (Tel 513-343-7575)

SPONSORING AGENCY: Transportation Development Agency

RESPONSIBLE INDIVIDUAL: Rudback, NE (Tel 514-283-4077)

Contract

STATUS: Active NOTICE DATE: July 1976 START DATE: Dec. 1974 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$17,320

ACKNOWLEDGMENT: Transportation Development Agency

11 110862

#### RESEARCH AND DEVELOPMENT WORK CONCERNING ELECTRODYNAMIC MAGNETIC LEVITATION-PHASE III

The study is concerned with non-contact suspension and propulsion for 300 mph interurban transportation. Magnetic levitation is produced by the repulsive interaction between superconducting magnets on a moving vehicle and the eddy currents induced in guideway mounted aluminum conductors. Propulsion is by a linear synchronous motor which also uses vehicle mounted superconducting magnets and energised guideway coils. A 25 ft diameter rotating wheel test facility has been built in Kingston to test full scale levitation and propulsion magnets. Vehicle characteristics and guideway configurations are being analysed. Theoretical and experimental studies of magnetic lift, drag and guidance forces and the linear synchronous motor are in progress. The Canadian study complements U.S. D.O.T. sponsored studies and there is also a technical information exchange agreement with Germany. Phase III (1975-77) of the maglev program is being directed towards expanding the theoretical base for maglev vehicle/guideway design and verifying the design concepts through experimental work. It is intended that the project will produce an identification of a feasible maglev design, mathematical models describing the levitation, guidance, suspension, stability, propulsion and dynamic performance of the vehicle and to verify the design proposals experimentally to the greatest extent practical, including full-scale system component tests on the 0-100 km/hr 7.6 diameter wheel facility at Queen's University.

REFERENCES:

Performance Characteristics of Variable Speed Linear Synchronous Motors, Dawson, GE; John, UI, Canadian Institute of Guided Ground Transport, Report No. 74-6, Aug. 1974

Interim Report on Linear Synchronous Motor Experimental Models, Dawson, GE; John, UI; Sen, PC; Bennett, JA, Canadian Institute of Guided

Ground Transport, Report No. 74-7, Aug. 1974

Superconducting Magnetic Levitation & Linear Synchronous Motor Propulsion for High Speed Guided Ground Transportation, Atherton, DLA; Eastham, AR, Canadian Institute of Guided Ground Transport, Report No. 75-5, Mar. 1975

Superconducting Magnetic Levitation and Linear Synchronous Motor Propulsion for High Speed Guided Ground Trans, Canadian Maglev Group, Phase III, Intrm CIGGT Rpt. 76-7, Mar. 1976

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, TDA07

INVESTIGATOR: Atherton, DL Eastham, EA Slemmon, G Robertson, SD Dawson, GE Burke, PE John, VI

SPONSORING AGENCY: Ministry of Transport, Canada, Transportation Development Agency; National Research Council of Canada

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1971 COMPLETION DATE: Mar. 1977

ACKNOWLEDGMENT: CIGGT

11 130488

#### WATER RESOURCES ASPECTS OF COAL TRANSPORTATION BY SLURRY PIPELINE

Large quantities of low sulfur coal are located in the western part of the United States, particularly in Wyoming, Montana, and the Dakotas. Unfortunately, available water resources in these areas are limited. The increased usage of coal has resulted in increased efforts regarding coal gasification and coal liquefaction. In addition, requirements for the reclamation of strip-mined land are forth-coming. In the low-sulfur coal areas of the West, the increased usage of coal conversion (either gasification or liquefaction) and reclamation of strip-mined land will add a substantial burden to already stressed water resources. Three significant water resource considerations are evident concerning coal transportation by slurry pipelines. These are the water quality deterioration that can be expected from the process, the possibility of using water of low quality (municipal and industrial effluents) as the source of water for the slurry, and the treatment procedures required both at dump stations and at the receiving end of the pipeline. The proposed research program includes all three of these major areas.

PERFORMING AGENCY: Arkansas University, Fayetteville, Water Resources Research Center

INVESTIGATOR: Moore, J

SPONSORING AGENCY: Department of the Interior, Office of Water Research and Technology, B-050-ARK

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$54,817

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GUY 203)

11 130949

#### THE DYNAMICS OF ELASTIC STRUCTURES WITH HIGH ELECTRIC CURRENTS

This research is a continuation of a program dealing with the mechanics of elastic structures carrying large electric currents. The experimental program will be extended to: (1) The study of the vibration and stability of a superconducting coil under its own field, and under external magnetic fields. (2) The generation of compressional and torsional stress waves by a transient magnetic field in a ferromagnetic elastic bar. (3) The dynamics of magnetically levitated vehicles on a rotation wheel. (4) The stresses and dynamics of a linear induction motor reaction rail using a rotating wheel. The analytical program will consider: (1) The prediction of deformation and stresses in beams and plates under a transient current pulse. (2) The calculation of stresses in rectangular and non-circular superconducting coils. (3) The study of currents, magnetic fields, and stresses in a linear motor reaction rail for a two-sided and single-sided motor. (4) The stresses in conductors due to a moving contact such as occur in power collectors, motor brushes, and superconducting homopolar motors.

This action provides a second year of support for continuing grant EN-7509079.

PERFORMING AGENCY: Cornell University, School of Engineering, Department of Theoretical & App Mech

INVESTIGATOR: Moon, FC  
 SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG75-09079 A01

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 TOTAL FUNDS: \$45,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5028 1)

#### 11 130956

##### PIPELINE TRANSPORTATION OF SOLIDS IN SLURRY FORM

Objective: To assist in the development of this technique for the transportation of bulk solids. Approach: (a) To conduct experimental studies of the factors governing energy consumption for typical materials in pipelines up to 12 inches in diameter; (b) to examine new materials or equipment proposed for such pipelines; (c) to study procedures or design changes which could reduce capital costs or improve pipeline reliability; (d) to examine the application of this new technique to new situations. Progress: 1. A thorough study of the pipeline behaviour of Western Canadian metallurgical coals in water: Studies of Manitoba limestone in water, Quebec iron ore in water, Saskatchewan potash in brine, and various sands in water have been completed. 2. A preliminary study of the preparation, pumping, separation and utilization of Western Canadian coal-oil slurries is being completed. 3. Various theoretical studies and research contract investigations for commercial clients are in progress. 4. Current plans include the study of mixtures containing coarse (one inch diameter and above) particles. The major application of such work will be in coal mining. Academic studies relating to these projects are also undertaken.

Co-Sponsors of this project are the National Research Council and the Saskatchewan Research Council.

##### REFERENCES:

Experimental Studies on Pipelining of Canadian Commodities: Report 1 to 9

Experimental Studies on Pipelining of Coal-Oil Slurries

PERFORMING AGENCY: Saskatchewan University, Canada, Saskatchewan Research Council & Department of Chem & Chem Eng  
 INVESTIGATOR: Husband, WH (Tel (306)343-2952) Haas, DB Shook, CA

SPONSORING AGENCY: Transportation Development Agency  
 RESPONSIBLE INDIVIDUAL: Gilbert, IF (Tel (514)283-5071)

Contract TDA-OSU76-00165

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (SJ 632)

#### 11 135604

##### COMMAND AND CONTROL SYSTEMS FOR ADVANCED TRANSPORTATION SYSTEMS

DESCRIPTION: This project is a study of new "people mover" concepts which may evolve to provide practical attractive alternatives to the private automobile as a mode of transportation. Each concept requires a command and control system not only to provide safety but also to ensure efficient and expeditious movement of traffic. In all cases operation is automatic with respect both to the onboard control of the propulsion and brakes of the individual vehicles and also to the overall coordination of system functions. Development effort has been directed toward meeting new requirements of advanced system concepts. Especially in the area of Personal Rapid Transit, controls are being developed to meet the conflicting need to achieve traditional standards of rapid transit safety while permitting the short headways necessary for acceptable capacity with small vehicles. A family of control systems is being realized for applications varying widely with respect to vehicle characteristics, guideway configuration, and operating policy (scheduled or demand modes of service).

PERFORMING AGENCY: General Railway Signal Company, Advanced Engineering Division

INVESTIGATOR: Auer, JH

SPONSORING AGENCY: General Railway Signal Company

STATUS: Active NOTICE DATE: May 1976 START DATE: July 1974 COMPLETION DATE: June 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AQ 881 2)

#### 11 138791

##### AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY

The AGT Program will develop a coordinated and comprehensive technical information base for automated guideway system development. In particular the technical information developed on the program will be organized into a structured data bank. This data bank will serve as the basis for periodic progress reports with program results distributed to government, universities and industry. The projects will fall into three general classifications: (1) System technology, (2) Subsystem and component technology, (3) Wayside technology.

Performing organization contracts not yet awarded.

SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: MacKinnon, D (Tel (202) 426-4048)

STATUS: Active NOTICE DATE: July 1976 START DATE: Nov. 1975 COMPLETION DATE: Jan. 1979 TOTAL FUNDS: \$12,725,000

ACKNOWLEDGMENT: UMTA

#### 11 138792

##### MORGANTOWN PRT SYSTEM

Develop a personal rapid transit system capable of carrying 5,000 passengers per lane per hour at a 15-second headway, prove the technical feasibility of a fully automated PRT, determine economic and service benefits of a PRT system and assess the institutional problems encountered in building such a system in an urban environment. The concept of automatic control for a vehicle system operating on close headways and the fail-safe concept using checked redundancy have been validated. Design for expansion of the system is underway.

PERFORMING AGENCY: Boeing Company; West Virginia University

SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Barsony, SA (Tel (202) 426-2896)

Contract WV-06-0005

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970 TOTAL FUNDS: \$9,000,000

ACKNOWLEDGMENT: UMTA

#### 11 138793

##### AUTOMATED GUIDEWAY TRANSIT INDEPENDENT STUDIES

The objectives of this project are to provide technical studies and analyses to support the development of critical technologies under the AGT program. The entire program was initiated in 1973 but the current phase calls for vehicle/guideway trade-off studies; environmental impact guidelines, functional analysis, and technical studies and analysis to support the automated guideway transit technology program.

PERFORMING AGENCY: Mitre Corporation

SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Izumi, G (Tel (202) 426-4047)

Contract UT-50016

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1975 COMPLETION DATE: May 1978 TOTAL FUNDS: \$460,000

ACKNOWLEDGMENT: UMTA

#### 11 148334

##### NON-CONTACT SUSPENSION/PROPULSION TECHNOLOGIES

An integrated magnetic levitation/propulsion system is a possible candidate for achieving noiseless, lightweight urban and moderate speed interurban transportation. The objective of this research is to explore the feasibility of such systems for high-speed inter urban transportation. A single-sided linear induction motor (LIM) and reaction rail will be fabricated and tested on the rotating wheel facility operated by the Canadian Institute of Guided Ground Transport at Queens University in Kingston, Ontario. These tests and subsequent analysis will be used to place SLIM performance in context with competing magnetic levitation schemes.

PERFORMING AGENCY: Mitre Corporation, Metrek Division

INVESTIGATOR: Milner, JL (Tel (703) 790-6456)

SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202)426-9365)

Contract DOT-UT-50016

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$353,493

ACKNOWLEDGMENT: DOT

11 148343

**DYNAMIC EXPERIMENTS OF ALTERNATIVE GUIDEWAY-VEHICLE SYSTEMS**

The purpose of this Project is to experimentally investigate vehicle-elevated guideway response dynamics. The first major objective is to experimentally validate the various analyses of vehicle-guideway dynamics developed within the past several years. The second objective is to experimentally investigate those vehicle-guideway configurations which because of complex geometries, have not yet received analytical treatment.

PERFORMING AGENCY: Duke University

INVESTIGATOR: Wilson, J (Tel (919)684-2434)

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202)426-9365)

Contract DOT-OS-60130

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1976 COMPLETION DATE: July 1978 TOTAL FUNDS: \$158,900

ACKNOWLEDGMENT: DOT

11 148344

**SENSITIVITY OF ELEVATED GUIDEWAY COST TO CONSTRUCTION TOLERANCE SPECIFICATION**

This research shall develop a methodology for relating guideway costs to the ride quality related aspects of elevated guideway construction and to identify the sensitivities of cost to critical vehicle-guideway parameters for a hypothetical group rapid transit (GRT) system. Detailed designs and costs for two specified levels of ISO Ride Quality Limits will be developed for the hypothetical GRT system.

Co-performing the research was Maguire (CE), Incorporated.

PERFORMING AGENCY: Massachusetts Institute of Technology

INVESTIGATOR: Wormley, DN (Tel (617)253-2246)

SPONSORING AGENCY: Office of the Secretary of Transportation; Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202)426-9365)

Contract DOT-TSC-1206

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May

1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$74,780

ACKNOWLEDGMENT: DOT

11 148346

**NON-CONTACT SUSPENSION/PROPULSION TECHNOLOGIES**

This is a US/Federal Republic of Germany cooperative research project. The objective is to determine the limits of allowable guideway flexibility and roughness for high-speed attraction magnetic levitation systems. Tests will be conducted using the German-developed 400 K/h KOMET test vehicle and track. The test data will be used to validate vehicle/guideway computer simulations which will be used to perform parametric studies.

PERFORMING AGENCY: Mitre Corporation, Metrek Division

INVESTIGATOR: Milner, JL (Tel (703)790-6456)

SPONSORING AGENCY: Office of the Secretary of Transportation; Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202)426-9365)

Contract DOT-TSC-1263

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$90,000

ACKNOWLEDGMENT: DOT

11 148347

**ASSESSMENT OF TECHNOLOGY BASE AND APPLIED RESEARCH FOR NON-CONTACTING VEHICLE SUSPENSION AND PROPULSION SYSTEMS**

The research shall assess critically the technological base available for the evaluation of non-contacting suspension and propulsion systems in urban and intercity transport systems. The assessment involves critical reviews of existing data, identification of gaps in current technology and areas which show promise for the future. An applied research program to provide performance data for selected ferromagnetic and fluid non-contacting propulsion and suspension systems complements the general assessment.

PERFORMING AGENCY: Massachusetts Institute of Technology

INVESTIGATOR: Hedrick, JK (Tel (617)253-2246) Richardson, HH

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202)426-9365)

Contract DOT-OS-60135

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: June 1976 COMPLETION DATE: June 1979 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: DOT

12 048790

**STUDY OF THE PHYSICAL PARAMETERS OF TRANSPORTATION ACCIDENTS**

This study will involve a literature data search of the various information which now exists with regard to the physical forces and parameters involved in transportation accidents. The study will analyze this data and develop accident damage test criteria to represent those accident conditions.

PERFORMING AGENCY: Energy Research and Development Administration

SPONSORING AGENCY: Materials Transportation Bureau, Department of Transportation; Energy Research and Development Administration

RESPONSIBLE INDIVIDUAL: Grella, AW (Tel 202-4262311)

IA DOT-AS-20071

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: May 1972 TOTAL FUNDS: \$65,000

ACKNOWLEDGMENT: TRAIS (PR# DOT-AS-20071)

12 048924

**STUDY OF CURRENT STATUS OF TRANSPORTATION SAFETY RESEARCH AND DEVELOPMENT**

The objective of this task is to determine the current status of transportation safety R&D by analyzing, reviewing, critiquing and/or performing pertinent studies in the field. Three study areas have been identified: analysis and critique of causal factor studies; analysis and critique of cost/benefit studies, and an investigation of the impacts of R&D innovations. The results of these determinations will be used as inputs to subsequent efforts aimed at maximizing the return on the safety R&D investment and to indicate avenues for future safety related R&D efforts.

PERFORMING AGENCY: Science Management Corporation, Decision Studies Group

INVESTIGATOR: Suto, P

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Smith, RT (Tel (617)494-2076)

Contract DOT-TSC-860 (CPFF)

STATUS: Terminated NOTICE DATE: Feb. 1977 START DATE: June 1974

ACKNOWLEDGMENT: TRAIS (PR# SP-0063 & A), OST

12 048967

**OPTIMIZATION OF AUDIBLE WARNING DEVICES**

The objective of this contract is to maximize effectiveness and minimize annoyance of motor and railroad carrier audible warning signals. The requirements for both urban and suburban areas will be investigated.

PERFORMING AGENCY: Society of Automotive Engineers; Bolt, Beranek and Newman, Incorporated

INVESTIGATOR: Hanson, CE (Tel (617)491-1850)

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Skeiber, SC (Tel (617)494-2443)

Contract DOT-TSC-868

STATUS: Completed NOTICE DATE: July 1976 START DATE: June 1974 COMPLETION DATE: July 1976 TOTAL FUNDS: \$99,000

ACKNOWLEDGMENT: TRAIS, TSC (PR# TMP-0205)

12 054567

**RAILROAD TANK CAR SAFETY VALVE TEST PROGRAM**

This program is being accomplished under the area of technology transfer in the AFRPL Rocket Propulsion Plan. This AFRPL conducted program will provide data required by the Federal Railroad Administration of the Department of Transportation in their job of seeking means to improve railroad tank car safety in accidents. The object of this program is to determine the relief and flow characteristics of class DOT-112A tank car safety relief valves. The program consists of four basis phases. The first phase of effort in this program is the analysis phase, and will define the most appropriate way to measure the performance of the relief valves. The second phase is system build-up. The third phase is valve testing and the last phase is preparation of the final report. Under the analysis phase additional ways to accomplish steady state and blowdown tests of saturated and superheated propane will be evaluated. The instrumentation needed to obtain flow data will be investigated and an instrumentation list compiled for each approach.

Each test approach will be analyzed for the capability to expand to test larger valves at a future date. Specific equipment and materials needed will be determined for each test approach. The third phase of the program will be to test the relief valves in water. GN2 and propane in accordance with approved procedures resulting from phase I. The first test to be run will be a proof test of the propane tank at one and one-half times the tank maximum working pressure of 500 psi. The nitrogen and water flow tests, to be run next, will check out the flow measurement capabilities of the system and provide flow data for the test values. These tests will also calibrate the epoxy flow nozzles used for flow measurement. Data from the nitrogen and water tests will be correlated with other data generated for these types of valves and will also serve as a baseline for comparison of known fluids with propane. The cracking and reset pressures of the test valves will also be determined. The propane flow tests will then be conducted. These tests will be conducted with saturated vapor, as well as saturated liquid which will flash through the valves. Flow rates for the valves will be determined for various pressures from cracking pressure of approximately 280 psig to 475 psig. The final item to be accomplished in the program will be to write a final report.

PERFORMING AGENCY: Department of the Air Force, Rocket Propulsion Laboratory

INVESTIGATOR: Silver, R

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, D (Tel (202)426-1227)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973 COMPLETION DATE: Feb. 1977

ACKNOWLEDGMENT: Science Information Exchange (ZQF342540 1)

12 055784

**TOXICOLOGICAL AND SKIN CORROSION TESTS ON HAZARDOUS MATERIALS**

Toxicological data are inadequate for classifying certain of the materials being transported. The work is to verify further the suitability of proposed transportation health hazards classification criteria and to permit classification of additional materials according to these proposed criteria.

PERFORMING AGENCY: Department of the Air Force, Toxic Hazards Division

SPONSORING AGENCY: Materials Transportation Bureau, Department of Transportation

RESPONSIBLE INDIVIDUAL: Harton, EE (Tel 202-4262311)

IA AS-40079

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: June 1974 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$58,880

ACKNOWLEDGMENT: TRAIS, Materials Transportation Bureau

12 058266

**RAILROAD TANK CAR FIRE PROGRAM**

The objectives of this task are to (1) perform laboratory scale fire tests to evaluate the effectiveness of coatings in providing fire protection for tank cars and (2) develop analytical models of pool and torch fires.

PERFORMING AGENCY: Ames Research Center, National Aeronautics and Space Administration

INVESTIGATOR: Mansfield, J (Tel 415-965-5991)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, D (Tel (202)426-1227)

AR-30033

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1973 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: FRA

12 058268

**HAZARDOUS MATERIAL RAILROAD TANK CAR TORCHING AND POOL FIRE STUDY**

The objectives of this task are to (a) construct a facility which would enable the flow structure and properties of a burning jet to be characterized and (b) design and conduct a series of torch and pool tests to evaluate the ability



of railroad tank cars to withstand the effects of torching with and without insulation

PERFORMING AGENCY: Ballistic Research Laboratory  
 INVESTIGATOR: Baicy, E (Tel 301-272-3979)  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Levine, D (Tel 202-426-1227)

AR-44061  
 STATUS: Active NOTICE DATE: July 1976 START DATE: Feb. 1974 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: FRA

#### 12 058683 TRANSPORTATION SAFETY ANALYSIS

This effort is intended to provide for DOT a first assessment of the safety implications of projected inter-city passenger movements based upon already existing data and estimating and projecting currently existing relationships. This first-generation model will not explicitly attempt to embody major structural shifts in the relationship between vehicular and demographic factors and safety outputs. The model will predict accidents, fatalities and injuries, by mode, incorporating contractor-identified forecasted inputs from TSC such as projected vehicle miles of travel, load factors, passenger miles of travel, schedule frequency/temporal distribution, the pleasure/business travel split, etc., as well as the safety interrelationships that can be derived from existing data.

PERFORMING AGENCY: Center For The Environment and Man, Incorporated  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, OS-543  
 RESPONSIBLE INDIVIDUAL: Smith, RT

Contract DOT-TSC-1089 (CPFF)  
 STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$34,984

ACKNOWLEDGMENT: TRAIS (OS-543)

#### 12 058838 SYSTEM SAFETY-AN INTERDISCIPLINARY APPROACH TO TRANSPORTATION SAFETY

The effort concerns an analysis of system safety at the planning and design stages of new transportation facilities, equipment or programs and in the operational stages of existing facilities or ongoing programs. Specific results shall be generated in methodology and guidelines and in case studies. The specific objectives of the first phase of the research are: 1. To transfer applicable systems reliability concepts to the transportation safety sector. 2. To identify and resolve key issues in transportation safety. 3. To develop a preliminary systems safety methodology applicable to the transportation modes.

PERFORMING AGENCY: Polytechnic Institute of New York, Department of Transportation Planning and Engineering  
 INVESTIGATOR: Pignataro, LJ (Tel (212) 643-5272) Cantilli, EJ Shooman, M  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Bolger, PH (Tel 202-4264458)

Contract DOT-OS-50241 (CS)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 TOTAL FUNDS: \$147,000

ACKNOWLEDGMENT: TRAIS (PUR-50315), OST, Polytechnic Institute of New York

#### 12 081788 RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT

This project is directed at improving the performance of tank cars in derailments and minimizing the danger of catastrophic tank car accidents. When initiated, it consisted of 12 Phases with additional Phases subsequently added. Phase 08, Reduced Scale Model Studies and Phase 13, Head Shield Study are completed. The other phases, on which work is continuing,

are the following: Phase 01--Accident Review; Phase 02--Accident Data Analysis; Phase 03--Material Study; Phase 04--Literature Review; Phase 05--Head Study; Phase 06--Safety Valve in Liquid Study; Phase 07--Safety Relief Devices; Phase 09--Design Study, Tanks and Attachments; Phase 10--Design Study, Car; Phase 11--Thermal Effects Studies; Phase 12--Vessel Failure Research; Phase 14--Stub Sill Car Buckling Study; Phase 15--Switchyard Impact Tests; Phase 16--Tank Car Wear Experiments.

PERFORMING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute  
 INVESTIGATOR: Phillips, EA (Tel 312-5673607)  
 SPONSORING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute  
 RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

#### 12 099389 RAIL VEHICLE SAFETY RESEARCH PROGRAM

This program has as its objectives: (1) Increase the safety of hazardous material cars; (2) Decrease number and severity of accidents caused by vehicle component failures; (3) Decrease the number of accidents caused by human error; (4) Reduce the number and severity of grade crossing accidents; (5) Improve communication and control systems. Torch and relief valve test facilities have been completed and used for the on-going hazardous material tank car project. On-board automatic inspection and monitoring systems are being developed as a means of component failure prevention. Development of cab and train handling simulator as part of the human factors project began late in FY 75. Modularized grade crossing equipment has been developed under the grade crossing safety project, which started in early FY 75.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
 RESPONSIBLE INDIVIDUAL: Levine, D (Tel (202) 426-1227)

STATUS: Active NOTICE DATE: July 1976

ACKNOWLEDGMENT: FRA

#### 12 099392 LOCOMOTIVE CAB SAFETY

A number of special projects directed toward improving the safety of the work space provided for operating crews in the cabs of locomotives have been undertaken. After an in-depth review of FRA-funded studies of accidents and potential hazards, it was determined that the railroad industry should respond with effective cab improvements. AAR had Electro-Motive and General Electric develop "clean" locomotive cab mock-ups. Modifications were based on reviews of these mock-ups. As a result, about 20 improvements are being incorporated in the cabs of production locomotives. These changes eliminate potentially hazardous sharp corners and edges, provide protective padding on certain exposed surfaces, provide added protection to prevent injuries associated with cab doors, provide improved drinking water facilities and improved sanitary facilities. Another project is a study of the consequences of head-on and rear-end collisions between trains. A test program is intended to provide the information necessary to redesign locomotives to increase the survival rate in train-to-train collisions. Furthermore locomotive cab seats are being examined in light of human factors criteria to arrive at generic specifications for the design and development of safer, more comfortable seats to be incorporated in new locomotive deliveries.

PERFORMING AGENCY: Association of American Railroads Technical Center  
 SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railroad Labor Organizations  
 RESPONSIBLE INDIVIDUAL: Hawthorne, KL (Tel (202)567-3584)

STATUS: Active NOTICE DATE: July 1976 START DATE: 1973

ACKNOWLEDGMENT: AAR

12 099424

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 2-ACCIDENT DATA ANALYSIS**

Analysis of accident data is handled under this phase. A general breakdown of the 1965-1970 data shows two main damage categories-mechanical and thermal. With few exceptions, the mechanical damage occurs first in the accident sequence. Exceptions involved fires originating from non-tank car sources. The analysis under this Phase includes the assignment of dollar losses incurred by the railroads due to product loss from the tank cars in these accidents. These losses are categorized by the specific types of damage which cause them. From this, the potential values of design solutions are determined. The values of overlapping solutions are also given. Some overlap positively and some negatively. For example, the value of a combined head and shell shield is greater than the sum of their individual values. Conversely, the value of a combined head and thermal shield is less than the sum of their individual values. All values must be reduced by the estimated efficiencies of actual design solutions which are developed. This leads to actual "benefit" values for each solution. The final cost effectiveness evaluation is made made simply comparing the actual benefit values with the estimated costs of solutions.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

12 099425

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 11-THERMAL EFFECTS STUDY**

The whole thermal question, including fire environment and thermally induced stresses, is being covered under this phase. The major activity has been a search for a practical heat shield material, such as an ablative, intumescent, or simply an insulating coating, that can be applied to the non-insulated 112A (114A) pressure tank cars, which are the cars most vulnerable to violent rupture from external heat. Many companies which produce fire protective coatings have submitted samples which were studied in a laboratory fire test apparatus which was designed for initial screening. Two of the most promising materials were selected for application to 1/5 scale model tank cars which were subjected to large enveloping fires. These tests were conducted at the White Sands Missile Range in cooperation with the FRA. The objectives were to confirm laboratory findings and theoretical analyses, to ascertain some of the properties of fires which were not yet will defined, and, finally, to prepare for subsequent full scale tests. This was followed by two full scale fire tests, one with an uncoated and the other with a coated tank. A report on these fire tests has been published. Currently, the "torch" type fire is being studied. This is a highly convective fire involving local impingement as compared to the highly radiative all-enveloping fire used in the tests just described. These torch fire studies are being conducted by FRA at the DOT Transportation Test Center. When these tests are complete it is planned to finalize a specification for use in qualifying candidate coating materials for actual application on tank cars. Such qualification will include performance requirements to be met in a redesigned (upgraded) laboratory fire test apparatus. The current major programs in this Phase concern impact and accelerated service tests (ALT) of tank cars equipped with sprayed on coating type and insulation-jacket type thermal shields. These tests are being conducted at the DOT Transportation Test Center to evaluate in service reliability of the thermal shields. The tank cars will accumulate a total of approximately 160,000 miles in the facility for accelerated tests (FAST) program at the DOT Test Center.

See also RRIS 12A 081788 and 12A 058266.

PERFORMING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

12 099427

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 7-SAFETY RELIEF DEVICES-GENERAL**

This Phase covers all currently used safety relief devices on all classes of tank cars. It has the general objective of seeking means, through design changes in these devices, for safer containment, or safer release, of hazardous products in accidents. Activity has not progressed beyond initial planning since, to date, there has not been sufficient evidence that either deficiencies exist or that design changes would lead to significant improvement. This Phase will be activated when and if, results from other studies (viz. Phases 01, 06, and 11) indicate such a need.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

12 099428

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 6-SAFETY VALVE DISCHARGE CAPACITY**

When a tank car carrying liquified compressed gas is heated in a fire, its contents can expand to where the tank can become nearly shellfull at the safety valve pressure setting. The safety valve must then maintain safe tank pressure by momentarily discharging liquid. It may also be called upon to do this through liquid discharge in the event the tank is overturned and exposed to fire. As in other pressure vessel codes, the tank car specifications require that safety valves be sized and tested on the basis of vapor discharge. There being no firm data on liquid discharge capacities, this Phase was established with the objective of determining such capacities by means of full-scale test. Toward this end, a special 20,000 gallon test tank was fabricated with provisions for mounting the currently used safety valves on both the top and bottom of the tank. The tank has been installed at Edwards Air Force Base, and tests have been run using water, air, and vapor and liquid LPG. This program is being conducted on a cooperative basis with the FRA. Results, not yet available, will be published after all data is reduced.

See also RRIS 12A 081788 and 12A 054567.

PERFORMING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

12 099436

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 1-ACCIDENT DATA COLLECTION**

This is a major Phase and deals with the collection and cataloging of accident data. Any accident involving a tank car, loaded or empty, in which there is damage to the tank, its attachments and fittings, or its insulating steel jacket, is included. During the first two years of the project, such data were collected for the six year period 1965-1970. Currently, an update is nearly complete covering the five year period 1971-1975. Following this, procedures are established for collecting data on a continuing basis. Most of the information has been coded and computerized. For the six year period 1965-1970 the files contain data on 3853 tank cars damaged in 2321 accidents. This corresponds to an annual average of 642 tank cars damaged in 387 accidents.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

12 130498

**A FIRE HAZARD EVALUATION OF THE INTERIOR OF WMATA METRORAIL CARS**

The object of this program was to evaluate, using small and full-scale tests, those components of risk to subway occupants which arise from the fire performance of the car's interior furnishings. While most of the work centered on this point, also examined was the car floor assembly for the likelihood of fire and smoke entering the interior through the floor.

## REFERENCES:

A Fire Hazard Evaluation of the Interior of WMATA Metrorail Cars, Braun, E, Oct. 1975

PERFORMING AGENCY: National Bureau of Standards, Department of Commerce, Programmatic Center of Fire Research, NBS No. 123/4927371

INVESTIGATOR: Lyons, JW

SPONSORING AGENCY: Washington Metropolitan Area Transit Authority  
RESPONSIBLE INDIVIDUAL: Garrett, VK, Jr (Tel (202)637-1158)

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 TOTAL FUNDS: \$77,600

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BL 649), Washington Metropolitan Area Transit Authority

12 130946

**QUANTITATIVE DESCRIPTIONS OF TRANSPORTATION ACCIDENTS INVOLVING HAZARDOUS MATERIALS**

Description: Sandia's continuing effort in this area includes the following major components: Assessment of the probability of occurrence and the severity of the five major environments (impact, fire, puncture, crush and immersion) experienced by casks or containers in air, highway and rail transportation. Analyses of these predicted environments to assess possible revisions or regulatory standards. Consideration of specific examples, e.g., the response of a radioactive material shipping cask involved in a rail grade crossing accident, to determine threat probabilities for potentially large contamination incidents. Revision of analytical descriptions to make the results more applicable to an increasing number of specific risk analysis studies aimed at optimizing procedures for transporting radioactive materials. Compilation of pertinent accident information in a data bank to provide retrievability of specific information to parties performing analyses.

This project is also supported by Sandia Laboratories.

PERFORMING AGENCY: Sandia Laboratories, Division of Applied Mechanics

INVESTIGATOR: Priddy, TG Hartman, WF Foley, JT

SPONSORING AGENCY: Energy Research and Development Administration, Division of Waste Management and Transportation

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GPW 51 1)

12 130957

**COMBUSTIBLE GASES, FLUIDS, AND MATERIALS**

Objective: To familiarize the CFR staff with the hazards in this area and identify the role of NBS in the reduction and control of hazards associated with the transportation and use of combustible gases, fluids, and materials and propose appropriate programs. Approach: Identify responsible agencies and programs and available accident data. Analyze accident data and identify deficiencies in existing programs. Propose appropriate programs for NBS to undertake.

PERFORMING AGENCY: National Bureau of Standards, Department of Commerce

INVESTIGATOR: Winger, JH

SPONSORING AGENCY: National Bureau of Standards, Department of Commerce, 4922676

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$37,400

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZBA 7042)

304

12 130966

**DEVELOPMENT OF A HEAT-ACTIVATED ALARM SYSTEM FOR RAILCARS CARRYING EXPLOSIVES**

To develop a simple, low-cost, portable heat-activated alarm system for protecting railroad boxcars carrying explosive materials for the navy. Railcars typically used for transporting explosive materials for the navy will be identified. Existing safety regulations and material handling method will be reviewed. The probable heat propagation mechanisms in these cars will be studied in light of the findings of accident investigations such as those compiled at Naval Weapon Center (NWC), China Lake and railroad companies. The desired characteristics of an optimum heat detection system such as the principle of detection, threshold temperature, response time, detector location, possible circuitry, alarm transmission, recording, and power requirements will be identified and design criteria developed. An experimental model of a heat-activated alarm system will be designed and breadboarded. Laboratory tests will be conducted under simulated conditions to determine the sensitivity and to insure the proper function of the system. Field tests will be conducted using existing large scale facilities such as those used by NWC. A prototype system will be constructed. A technical note will be issued on the prototype heat alarm system development.

PERFORMING AGENCY: Naval Civil Engineering Laboratory, Department of the Navy

INVESTIGATOR: Jenkins, JF Alumbaugh, RL

SPONSORING AGENCY: Naval Facilities Engineering Command, Department of the Navy, DN587075

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQN587075 1)

12 135594

**STUDY OF PHYSICAL PARAMETERS OF TRANSPORTATION ACCIDENTS**

The aim of the project is to extend the Transportation Accident Criteria study to describe the transportation accident environments to which large shipping casks can be exposed. These descriptions are required to determine the risk of shipment and for use in preparing environmental impact statements. Study will cover truck, rail, and waterways transport and include frequency of occurrence of impact, crush, puncture, fire, and immersion subsequent to such accidents.

PERFORMING AGENCY: Sandia Laboratories, ALO 117B

INVESTIGATOR: Hartman, WF (Tel (505) 264-4753) Dennis, A

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract E(29-1)-789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1972 TOTAL FUNDS: \$371,000

ACKNOWLEDGMENT: Energy Research and Development Administration

12 135595

**PRELIMINARY ANALYSIS OF SAFETY ASSESSMENT IN TRANSPORTING RADIOACTIVE MATERIALS IN THE COMMERCIAL SECTOR**

The aim of the project is to examine the technical basis for analyzing safety in transport of radioactive materials with the objective of providing program definitional assistance to NRC transportation research activities.

PERFORMING AGENCY: Sandia Laboratories, 06-19-05 A1035

INVESTIGATOR: Luna, R (Tel (505) 264-5276)

SPONSORING AGENCY: Nuclear Regulatory Commission

RESPONSIBLE INDIVIDUAL: LaHS, W (Tel (301) 443-6947)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Nuclear Regulatory Commission

12 135596

**MAINTENANCE OF A TRANSPORTATION ACCIDENT ENVIRONMENTAL DATA BANK**

The maintenance of this data bank involves the active pursuit of sources of new data, the updating of indices, and responding to official users who wish to obtain environmental data. A necessary part of this continued work is the

processing of data and entry into the storage and retrieval system. As needs for new data are identified, these will be sought. User requests for nonexistent data are expected to be a major contributor to this identification.

## REFERENCES:

Transportation Accident Environment Data Index Foley, JT; Davidson, CA, SAND 75-0248

PERFORMING AGENCY: Sandia Laboratories, AL 0517A  
 INVESTIGATOR: Foley, JT (Tel (505) 264-3036)  
 SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division  
 RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract AT(29-1) 789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 TOTAL FUNDS: \$216,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 12 135597

## NEW STANDARDS FOR PACKAGE SAFETY QUALIFICATION TESTS

The aim of the project is to develop a practical set of test regulations and procedures in coordination with the pertinent Governmental agencies which are consistent with the earlier Transportation Accident Criteria Study. Candidate standards will be established; a test series will be designed and conducted on a selected container to be provided by ECT. Finally, the proposed system will be presented and justified to standards personnel.

PERFORMING AGENCY: Sandia Laboratories, AL 0917B  
 INVESTIGATOR: Hartman, WF (Tel (505) 264-4753)  
 SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division  
 RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract E(29-1)-789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$312,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 12 135598

## IMPACT ANALYSIS PROGRAM

The aim of the project is the promotion of a better understanding of the impact phenomena and the development of better techniques of evaluating the behavior of Type B packages subjected to impact loading. Existing analysis methods for each specific load configuration will be developed. Material property needs will be identified. Finally, procedures will be selected and analysis techniques developed for application to particular needs.

PERFORMING AGENCY: Los Alamos Scientific Laboratory, LS 8217A  
 INVESTIGATOR: Neudecker, JW (Tel (505) 667-7021)  
 SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division  
 RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract W-7405-ENG-36

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: July 1977 TOTAL FUNDS: \$405,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 12 135599

## FULL SCALE VEHICLE TESTING PROGRAM

This project plans full scale accident tests to determine the integrity of shipping casks for transportation of nuclear wastes. The problem of transporting nuclear wastes becomes more acute as operating reactors increase. Demonstrations of shipping container integrity are necessary. Three extreme accident full scale tests using obsolete casks are planned: (1) High speed locomotive impact on stalled truck cask; (2) High speed derailment of rail cask into solid abutment followed by fire; (3) Truck mounted cask at high speed into solid barrier. Modeling and analysis will precede instrumented tests. Results will aid in prediction of performance of currently used, better designed casks.

PERFORMING AGENCY: Sandia Laboratories, AL 3617A

INVESTIGATOR: Yoshimura, RH (Tel (505) 264-2452)

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract E(29-1)-789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$1,170,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 12 135719

## DYNAMIC PROPERTIES OF PACKAGING MATERIALS IN TRANSPORT ACCIDENTS

The aim of the project is to develop data on dynamic material properties for materials of construction for shipping casks, particularly those properties required for analysis of transport accidents. Structural problem areas during dynamic loading of shipping casks will be delineated; experimental techniques (mostly models) will be used for material and structure studies. Results will be used as benchmarks for computer codes being developed at LASL for dynamic loading problems of shipping casks.

PERFORMING AGENCY: Battelle Memorial Institute, CH 0407A  
 INVESTIGATOR: Robinson, RA (Tel (614) 424-6424 X3414)  
 SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division  
 RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract W-7405-ENG-92

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Energy Research and Development Administration

## 12 136084

## TRANSPORTATION SAFETY STUDIES

The aim of the project is to develop and use a model for assessing the risks associated with the shipping of radioactive and other hazardous materials. Failure characteristics and thresholds will be determined for crush, impact, puncture, fire, and water immersion. Evaluation of release consequences will be assessed. Existing data sources on equipment failure rate, accident frequency, and accident severity will be used to fullest extent possible, supplemented by surveys or other means when data is not available.

## REFERENCES:

An Assessment of the Risk of Transporting Plutonium Oxide and Liquid Plutonium Nitrate by Truck, McSweeney; Hall, BNWL-1846, Aug. 1975

PERFORMING AGENCY: Battelle Memorial Institute/Pacific Northwest Labs, RL 5917B

INVESTIGATOR: Hall, RJ (Tel (509) 946-2459)

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract ERDA AT-(45-1)-1830

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1973 TOTAL FUNDS: \$668,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 12 138531

## SAFETY AND RELIABILITY

The objective is to improve the safety and reliability of urban rail systems through data gathering, analysis and hardware development. This includes vehicle crashworthiness analysis (current and proposed models) and computer models, feasibility studies of obstacle detection and study of safety hardware along with establishment of National Reliability Data Bank.

PERFORMING AGENCY: Transportation Systems Center, Department of Transportation

SPONSORING AGENCY:

RESPONSIBLE INDIVIDUAL: Spencer, PE (Tel (202) 426-0090)

Contract UM-604

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1974 TOTAL FUNDS: \$2,800,000

ACKNOWLEDGMENT: UMTA

12 138567

**SAFETY VALVE STUDY**

By analysis and small scale experiments, study the flow phenomena occurring when a safety valve of a pressurized tank car discharges when engulfed in a fire.

PERFORMING AGENCY: Maryland University, College Park  
 INVESTIGATOR: Sallet, DW (Tel (301) 454-4216 Ext 4)  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Dancer, D (Tel (202) 426-1227)

Contract DOT-FR-64181  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976  
 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

12 139173

**TRANSPORTATION OF HAZARDOUS MATERIALS**

To aid in proposed redesign evaluations, a systems analysis of hazardous materials tank cars and tank trucks is to be developed in which those system parameters most likely to influence the severity of an accident can be identified. An analytical model should be developed to estimate the risks to people, property and the environment for various accident scenarios as a function of the tank system parameters.

Contract not yet awarded.

SPONSORING AGENCY: Office of the Secretary of Transportation, Office of Research and Development; Office of University Research, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Dancer, D (Tel (202) 426-1227)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1977

ACKNOWLEDGMENT: FRA

12 148324

**THE DEVELOPMENT OF A SYSTEMS RISK METHODOLOGY FOR SINGLE AND MULTI-MODAL TRANSPORTATION SYSTEMS**

The purpose of the research is to develop and verify a probabilistic systems methodology for the quantitative risk assessment of existing or future transportation systems. The specific objective of the first phase of the research is to develop preliminary risk models for estimating the probability of failure of each major component in air transportation, rail transportation and highway transportation. The major risk related components in a rail transportation system can be identified as: 1) train operation, 2) signals, 3) equipment and rolling stock, and 4) track system. The studies accomplished confirm that a system safety methodology, such as the one under development in this program, is long overdue. The overall framework for the systematic risk analysis has been developed, information required for the successful application of the risk model has been collected, and analysis of the information is ongoing. Fault tree analysis, delineating various risk paths, has been conducted for both the highway (vehicle and human factor areas) and the rail mode. On the rail side, models predicting accident

probabilities from data on rail defects have been utilized. Because of the existence of numerous backup systems, single system failures rarely cause serious accidents. Thus the analysis framework of air safety is markedly different from the techniques used for rail or highway safety evaluation.

## REFERENCES:

Development of a Risk Methodology for Transportation Systems Safety, Transportation Systems Safety Research Group, Technical Report, Feb. 1976

PERFORMING AGENCY: Illinois University, Urbana, Department of Civil Engineering  
 INVESTIGATOR: Ang, AHS  
 SPONSORING AGENCY: Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Fetherolf, MD

Contract DOT-OS-50238

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$129,560

ACKNOWLEDGMENT: DOT

12 148348

**TRANSPORTATION SAFETY INFORMATION SYSTEM (TRANSIS)**

The objective of this system is to make data and information on safety performance and on on-going safety activities in all transportation modes readily available to DOT managers to allow intermodal comparisons. The system contains national data on accidents, injuries, and fatalities by month and by transportation mode, with certain exceptions due to limitations within modal accident reporting systems. Data and information are collected from DOT operating elements on a quarterly basis.

PERFORMING AGENCY: Transportation Systems Center, OE-608  
 INVESTIGATOR: Gay, WF (Tel (617)494-2450)  
 SPONSORING AGENCY: Department of Transportation, Office of Safety Affairs  
 RESPONSIBLE INDIVIDUAL: McDonald, G (Tel (202)426-4468)

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: DOT

12 148359

**TRANSPORTATION OF HAZARDOUS MATERIALS**

A study of rail transport of hazardous materials within Illinois will include the legal framework controlling such movements, an evaluation of hazardous materials accident reporting systems and determination of the frequency of hazardous materials shipments. The report will be the basis for recommendations for legislation to control such shipments.

PERFORMING AGENCY: Battelle Memorial Institute/Pacific Northwest Labs  
 SPONSORING AGENCY: Illinois Commerce Commission  
 RESPONSIBLE INDIVIDUAL: Stern, H (Tel (217)782-7000)

STATUS: Active NOTICE DATE: Feb. 1977 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: Battelle Memorial Institute/Pacific Northwest Labs

**13 054560**

**DEVELOPMENT OF NEW CORROSION PROTECTION DEVICES FOR SUBWAY EQUIPMENT**

Description: To research and develop new or improved corrosion protection devices for subway equipment installed in severely corrosive environments. Project will result in improved reliability and safety to public and operating personnel and will reduce maintenance costs.

PERFORMING AGENCY: Long Island Lighting Company  
 SPONSORING AGENCY: Long Island Lighting Company  
 RESPONSIBLE INDIVIDUAL: Driscoll, TJ

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Science Information Exchange (AP 698)

**13 099411**

**CANADIAN RAILWAY ELECTRIFICATION STUDY PHASE I-DEVELOPMENT OF STUDY PLAN**

OBJECTIVES: To bring into sharper focus the time frame that electrification of significant portions of Canadian railways is likely to occur, and to develop and describe a program of investigation, research, and development designed to permit a smooth transition to effective electrified operation at that time. SCOPE AND METHOD: Identify the factors upon which the Canadian decision to electrify is dependent, or which will influence that decision. Explore these factors in order to determine their effect on the timing and economics of conversion, and to identify gaps in technological, operational and managerial knowledge or skills necessary to achieve conversion satisfactorily. Develop programs of investigation, research and development to overcome the identified gaps in technological, operational and managerial knowledge or skills, and to enable smooth transition to electrified operation under Canadian conditions. Identify the cost items involved in electrification and recommend an approach for the methodology for costing the electrification stages. Establish general economic criteria for evaluation of the electrification decision. Identify alternative approaches to, and methods of, financing electrification. Develop and recommend a process for monitoring future trends of relevant characteristics of particular factors which will have a significant influence on the electrification decision. Consider and suggest appropriate areas for Canadian railway pilot electrification projects, both freight and passenger, which might be implemented as intermediate, experience gaining steps towards major conversions, and suggest the rationale and general planning for their implementation.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
 INVESTIGATOR: Cornell, ER (Tel 613-547-5777)  
 SPONSORING AGENCY: Transportation Development Agency  
 RESPONSIBLE INDIVIDUAL: Brenckmann, M (Tel 514-283-7846)

Contract 14 ST. T8200-5-5507

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1976 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$144,000

ACKNOWLEDGMENT: Transportation Development Agency

**13 129700**

**RAILROAD ELECTRIFICATION/ENERGY PROGRAM**

Project Independence seeks to reduce vulnerability to petroleum import disruptions--electrification of a major segment of the nation's railroads will contribute toward this goal. FRA is in the planning state of an electrification program for identifying the nation's and the railroad operator's benefits, which accrue from electrification, determining the incentives which the railroad industry needs to start electrification, and doing R&D where it is most cost effective in the field of electrification. Already established is the

fact that 100,000 barrels of petroleum would be saved per day if 22,000 miles of track were electrified (and 22,000 seems economically justified.). Additional savings would result if modal shifts from auto and intercity truck freight occurred. There are plans to electrify the 14-mile passenger track at the Transportation Test Center. The immediate use of the electrified track will be for testing of Northeast Corridor equipment prior to putting it into revenue service and for determining cost-effective methods of installing the catenary system. In addition, the railroad industry will be surveyed to determine what use they may have for the facility.

Contract not yet awarded, planned for FY 1977.

SPONSORING AGENCY: Federal Railroad Administration, Office of Passenger Systems Research and Development  
 RESPONSIBLE INDIVIDUAL: Novotny, RA

STATUS: Proposed NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

**13 131757**

**ENVIRONMENTAL AND ENERGY IMPACTS OF RAILROAD ELECTRIFICATION**

Description: The potential environmental and energy impacts associated with conversion of land transportation modes are being evaluated in terms of reductions in air pollutant emissions, ambient air pollutant levels along roadways and railway lines, noise pollution, and reduced water pollution impact. Specific studies are being conducted of freight and passenger traffic diversion in the Houston-Dallas intercity corridor, of long distance coal energy transshipment from Wyoming to Texas, and for short line coal-hauling railroads in Texas. Comparative impacts upon localized ambient air quality are being projected for mobile line source highway and diesel rail modes with stationary point source coal-fired power plants used to power electrified railroads. Energy consumption requirements for freight and passenger railroad electrifications are developed for comparison to alternative modes.

PERFORMING AGENCY: Texas University, Austin, Department of Civil Engineering

INVESTIGATOR: Cooper, HBH, Jr

SPONSORING AGENCY: Texas University, Austin, Center for Energy Studies

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (NTX 487)

**13 138475**

**WAYSIDE FLYWHEEL ENERGY STORAGE CONCEPT**

This project will study the technical and economic feasibility of a wayside flywheel energy recovery system. The system to be studied would employ flywheels located in wayside stations for the purpose of storing braking energy of trains descending a grade for later utilization by other trains ascending a grade in same area. The study will consider suitable locations for wayside stations and establish locomotive/train parameters to be considered in such a system.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr (Tel (202) 426-0855)

STATUS: Proposed NOTICE DATE: May 1976

ACKNOWLEDGMENT: FRA

15 045815

**BART IMPACT PROGRAM**

Under this task TSC is providing staff personnel and special consultants necessary to perform required management functions for the complex and comprehensive BART Impact Program. Management of the four basic types of tasks as specified by the basic ordering agreement will be provided. A summary of these tasks is as follows: (1) overall management and data management, (2) specific analysis efforts, (3) identifying particular impact areas, (4) specialized efforts of overall program objectives.

PERFORMING AGENCY: Metropolitan Transportation Commission  
 SPONSORING AGENCY: Office of the Secretary of Transportation; Department of Housing and Urban Development  
 RESPONSIBLE INDIVIDUAL: Weiner, E (Tel (202) 426-4168)

Contract PPA-OP-634

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: June 1973 TOTAL FUNDS: \$146,900

ACKNOWLEDGMENT: TRAIS (PR# DOT-OS-30176)

15 045966

**A METHOD FOR ASSESSING PRICING AND STRUCTURAL CHANGES ON TRANSPORT MODE USE**

Development of a mechanism which is capable of examining a policy change, for example, a central business district parking surcharge, and of tracing out the effects of such a change, not only on the relative utilization of alternative modes, but also on the spatial distribution of travel from changes in modal usage.

PERFORMING AGENCY: Northwestern University, Evanston, Department of Civil Engineering, 6078-414  
 INVESTIGATOR: Stopher, PR  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Weiner, E (Tel 202-4264168)

Contract DOT-OS-40001

STATUS: Active NOTICE DATE: Jan. 1976 START DATE: Apr. 1974 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$196,000

ACKNOWLEDGMENT: TRAIS (PR# DOT-OS-40001), Northwestern University, Evanston

15 129701

**METRO IMPACT STUDY**

As part of its ongoing programs, the Washington Area Council of Governments is conducting for UMTA an assessment of impacts of the METRO rail system in the Washington area. The program is somewhat narrower in scope than the BART Impact Work, with more extensive consideration of construction impacts.

PERFORMING AGENCY: Metropolitan Washington Council of Governments, 1225 Connecticut Avenue, NW  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Office of Transit Planning  
 RESPONSIBLE INDIVIDUAL: Ettinger, J

STATUS: Active NOTICE DATE: July 1976

ACKNOWLEDGMENT: UMTA

15 129717

**EFFECT OF TRANSIT SERVICE ON AUTO OWNERSHIP**

Develops a theoretical behavioral model to estimate auto ownership that takes into account existing behavioral processes, as well as the effects of changes in technology and policy inputs. A simultaneous model of auto ownership and mode choice to work is developed. The resultant model examines the sensitivity of auto ownership to various transportation policies through the development of elasticities of auto ownership with respect to transit level of service and with respect to auto ownership and operating costs.

PERFORMING AGENCY: Cambridge Systematics  
 SPONSORING AGENCY: Office of Policy, Plans and International Affairs  
 RESPONSIBLE INDIVIDUAL: Weiner, E (Tel 202-426-4168)

Contract DOT-OS-30056

STATUS: Active NOTICE DATE: July 1976

ACKNOWLEDGMENT: Office of Policy, Plans and International Affairs

15 129718

**INTEGRATED TRANSPORTATION AND LAND USE PLANNING**

Contractor is to integrate land use modeling and transportation modeling. The result of the research will be a package that can comprehensively investigate the interactions of transportation policy and the resulting land use patterns.

PERFORMING AGENCY: Pennsylvania University, Philadelphia

INVESTIGATOR: Putman, SH

SPONSORING AGENCY: Office of Policy, Plans and International Affairs; National Science Foundation

RESPONSIBLE INDIVIDUAL: Weiner, E (Tel 202-426-4168)

Contract DOT-AS-50064

STATUS: Active NOTICE DATE: July 1976

ACKNOWLEDGMENT: Office of Policy, Plans and International Affairs

15 129719

**A STUDY TO EVALUATE THE LAND-USE IMPACTS OF MAJOR RAPID TRANSIT IMPROVEMENTS IN THE U.S. AND CANADA**

The objective of the project is to evaluate the land-use impacts of recent major rapid transit improvements in the U.S. and Canada, with the purpose of guiding future policy in investment choices among various modes. In particular, the study will evaluate transit investments and their impact upon total population growth, promotion of densities, decline or improvement of the CBD and similar land-use impacts of transit.

PERFORMING AGENCY: De Leuw, Cather and Company

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Weiner, E (Tel (202)426-4168)

Contract DOT-OS-60181

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: Office of Policy, Plans and International Affairs

15 148353

**COMMUNITY AND CITIZEN INITIATIVES FOR DEVELOPING PASSENGER TRANSPORTATION CENTERS AT EXISTING HISTORIC RAILROAD STATIONS**

To encourage joint use of existing historic terminals as intermodal transportation centers in combination with other community uses and community use of other historic transportation facilities and to identify implementation and funding problems, a study of railroad terminal locations will be made. This study of transportation facilities will be made in consultation with municipal, civic and private organizations concerned with preservation and reuse programs. The study will document the following: Adaptive reuse as transportation centers and benefits therefrom; other adaptive community uses and their benefits; financial data and procedures involved in achieving such utilization.

Contract not yet awarded to a performing organization.

SPONSORING AGENCY: Department of Transportation, Office of Environmental Affairs

RESPONSIBLE INDIVIDUAL: Crecco, RF (Tel (202)426-4298)

STATUS: Active NOTICE DATE: Feb. 1977 COMPLETION DATE: Mar. 1978

ACKNOWLEDGMENT: DOT



16 058398

**CATEGORIZATION AND MEASUREMENT STANDARDS FOR TRUCK AND BUS FUEL ECONOMY IMPROVEMENTS**

DOT desires to gather information and consensus recommendations on measurement methods for commercial vehicle fuel economy and how those measures relate to vehicle productivity.

PERFORMING AGENCY: Society of Automotive Engineers  
SPONSORING AGENCY: Transportation Systems Center, OS-514  
RESPONSIBLE INDIVIDUAL: Mason, RL

Contract DOT-TSC-1007 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 TOTAL FUNDS: \$99,896

ACKNOWLEDGMENT: TRAIS (OS-514)

16 058730

**STUDY OF ENERGY AND ECONOMIC IMPACTS OF PROJECTED FREIGHT TRANSPORTATION IMPROVEMENTS**

A comprehensive assessment of present and future energy costs for each of the major freight modes along with an accounting of the economic and environmental impacts of the anticipated changes in freight systems and a projection of resultant modal shares in 1980 and 1985 will be made.

## REFERENCES:

A study of Energy and Economic Impacts of Projected Freight Transportation Improvements, Peat, Marwick, Mitchell and Company, Nov. 1976

PERFORMING AGENCY: Peat, Marwick, Mitchell and Company  
INVESTIGATOR: Leilich, R (Tel (202)223-0525)  
SPONSORING AGENCY: Transportation Systems Center, 55 Broadway, OP-502  
RESPONSIBLE INDIVIDUAL: Pollard, J (Tel (617)494-2127)

Contract DOT-TSC-1001 (CPFF)

STATUS: Completed NOTICE DATE: Feb. 1977 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$99,000

ACKNOWLEDGMENT: TRAIS (210-0094-AT)

16 128051

**RAIL VEHICLE POWER AND ENERGY CONSUMPTION STUDY**

The purpose of this study, which is part of the general Energy Management Program, is to determine the power requirements and energy consumptions of transit vehicles operating in free air and in tunnels under various conditions as specified by operational parameters such as acceleration, maximum speed, station spacing etc. The study first establishes the mechanical limits of power requirements, energy consumption, regeneration and energy storage in terms of the operational conditions and free air and in tunnels. The calculations within this part of the study will use the results of the aerodynamic drag study (project #3605) and operational criteria established in other studies. The study then incorporates the performance characteristics of various propulsion systems-DC series, shunt or separately excited motors, as well as AC motors-with and without energy saving devices such as choppers and flywheels. The study relies here on input from investigations carried out by the Electrical Group. The resulting calculations will produce actual power and energy consumption profiles of the different propulsion systems under the various operational conditions considered. The energies associated with drags, momentum change, regeneration and equipment losses will be identified. The results will be used in the Economic Evaluation Program to determine the viabilities of the various propulsion options. The viable alternatives will then be investigated further with refined performance data and extended operational ranges in order to provide basic data for preliminary conceptual design of the total energy system. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communic, Can, 3607  
INVESTIGATOR: Soots, V Palm-Leis, A  
SPONSORING AGENCY: Ontario Ministry of Transportation & Communic, Can

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

16 129720

**TRANSPORTATION ENERGY CONSUMPTION AND URBAN FORM RELATIONSHIP**

There is a long-term need to reduce energy consumption in all sectors of the economy and urban transportation is a major user. The project will extend previously developed simulation studies to explore and verify, analytically and empirically, the fundamental relationship between urban land form, the transportation system, and transportation energy consumption. Via simulation, urban form, defined in terms of shape, density, and land use arrangements, will be constructed to estimate travel requirements and compute resulting energy consumption. It will identify realistic policy options that, if implemented, could affect land use and the transportation system and identify their effect on energy consumption at both the micro and macro levels. Alternative policy options will be explored via a literature search and those parameter values which can be influenced by policy options will be identified. Guidelines for allocation of resources for urban development, for assessment of land-use controls, and for development of land-use plans should results.

PERFORMING AGENCY: Northwestern University, Evanston, Department of Civil Engineering

INVESTIGATOR: Schofer, JL (Tel 312-492-5183)

SPONSORING AGENCY: Office of the Secretary of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Weiner, E (Tel 202-426-9366)

Contract DOT-OS-50113

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1975 COMPLETION DATE: July 1976 TOTAL FUNDS: \$43,800

ACKNOWLEDGMENT: OST

16 129721

**MEASUREMENT OF RAIL TRANSPORTATION FUEL CONSUMPTION**

This project has the objective of establishing accurate information concerning fuel consumption of railroad freight trains in a variety of actual operations. Initial emphasis will be on TOFC/COFC service. Accurate basic data is being collected in cooperation with a number of railroads, for revenue-service trains, and analyzed to provide results of general applicability. The analysis will be utilized to validate an analytical model developed for predicting fuel consumption as a function of various parameters and operating conditions.

## REFERENCES:

Railroads and the Environment-Estimation of Fuel Consumption in Rail Transportation, Volume 1-Analytical Model, May 1975, PB-244150/AS

PERFORMING AGENCY: Transportation Systems Center, Department of Transportation

INVESTIGATOR: Hopkins, JB (Tel 617-494-2148)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Koper, JK (Tel 202-426-0808)

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: Jan. 1975 COMPLETION DATE: Oct. 1977

ACKNOWLEDGMENT: FRA

16 135132

**INCREMENTAL COSTS AND TRADE-OFFS BETWEEN ENERGY EFFICIENCY AND PHYSICAL DISTRIBUTION EFFECTIVENESS IN THE INTERCITY FREIGHT MARKET**

This is a pioneer study to develop an analytical model to measure the physical distribution costs, transportation performance alternatives, and energy use for commodities of various densities and values shipped by rail, motorcarriers, and watercarriers in specific intercity freight markets. Also to be considered are the individual modes of transportation and the impact of these alternatives on intra-and inter-modal performance. Furthermore, aggregate policy scenarios will be developed to interrelate individual policies and assess energy, modal shifts, and dollar impacts of various government strategies.

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies

SPONSORING AGENCY: Federal Energy Administration, CO-50154-00

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975  
 ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BP 451)

**16 135137**  
**PRICE ELASTICITIES OF DEMAND FOR TRANSPORTATION FUELS**

This research will develop improved models of the transportation demands for gasoline, jet fuel and diesel fuel. These models will be used to forecast transportation fuel demands over the 1975-1990 price periods using scenarios incorporating various fuel price and conservation policies and economic conditions. The first part of the study will be a state-of-the-art review of existing econometric fuel demand studies, transportation studies and preparation of an annotated bibliography. Available data bases will also be collected and analyzed. The second part of this study will develop models to measure the demand for transportation fuels by type of use (urban/in-terurban, passenger/ freight) and mode (auto, bus, air, truck, etc.). The third part of this study is a forecast of transportation fuel demand using a model of passenger automobile fuel demand, a model of fuel demand for truck and rail freight, a model of aviation fuels demand, algorithms to split auto and truck fuels demand into gasoline and diesel and any necessary supplemental information. Carefully chosen scenarios will be used to model the effects of changes in fuel prices on the total demand for each of the three fuels-jet, diesel and gasoline.

PERFORMING AGENCY: Charles River Associates, Incorporated  
 INVESTIGATOR: Campbell, H  
 SPONSORING AGENCY: Federal Energy Administration, C-04-50115-00  
 RESPONSIBLE INDIVIDUAL: Chiffriller, K

STATUS: Active NOTICE DATE: Sept. 1975 START DATE: Feb. 1975  
 TOTAL FUNDS: \$111,500

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BP 447),  
 Federal Energy Administration

**16 136028**  
**STUDY TO AID THE FEDERAL ENERGY ADMINISTRATION IN UNDERSTANDING THE MICRO-ECONOMIC ASPECTS OF ENERGY CONSERVATION**

The study will provide micro-economic analyses of the following energy conservation actions: 1. Improvement of automobile efficiency, both in terms of stock and use; 2. Improvement of thermal properties of existing residential structures; 3. Establishment of minimum energy standards for new residential and commercial buildings; 4. Improvement of industrial use of energy, with particular attention to natural gas and the socially optimal level of replacement of capital stocks; 5. Enhancement of electric utility load management; and 6. Improvement of freight transportation, with consideration of air, water, rail, highway and pipeline modes.

PERFORMING AGENCY: Institute for Defense Analyses  
 SPONSORING AGENCY: Federal Energy Administration, CO-04-50174

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BP 379)

**16 136071**  
**ENERGY TRANSPORT AND DISTRIBUTION RESEARCH**

Description: This project will further the goals of Project Independence by seeking the best combination of methods for exploiting available fuels and distributing energy. For example, development of coal resources involved trades in whether coal is used to generate electricity on site, or distributed as a fuel in bulk by trains or in slurry via pipeline. Environmental pollution restrictions can be satisfied by gasification, liquefaction, or conversion of

coal to methanol on site followed by shipment of the resultant fuel, or by bulk shipment of coal and stack gas cleaning following combustion. Full evaluation of the competing technologies must include comparison of transportation and distribution economics. Additional trades are required in consideration of power plant centralization versus shipping fuel in bulk or various intermediate forms to decentralized power plants.

PERFORMING AGENCY: Boeing Company, Engineering Division  
 INVESTIGATOR: Payne, NR  
 SPONSORING AGENCY: Boeing Company  
 STATUS: Active NOTICE DATE: May 1976 START DATE: Jan. 1976  
 COMPLETION DATE: Dec. 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (JBO 20 1)

**16 138528**  
**INTERCITY RAIL ENERGY EFFICIENCY**

The major objectives are to develop: Passenger Train Performance Model and a Rail Passenger Demand Model. The Buffalo/New York City Rail route is being used as a scenario for modeling and evaluation. A considerable amount of data are being collected. Last part of the research is estimation of energy efficiency of intercity rail system.

PERFORMING AGENCY: Union College, Mechanical Engineering Department  
 INVESTIGATOR: Mittal, RK (Tel (518)370-6268)  
 SPONSORING AGENCY: Department of Transportation, Office of University Research  
 RESPONSIBLE INDIVIDUAL: Novotny, RA

Contract DOT-OS-60124

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1976  
 COMPLETION DATE: July 1977 TOTAL FUNDS: \$39,110

ACKNOWLEDGMENT: Union College

**16 148321**  
**ENERGY MANAGEMENT FOR ELECTRIC POWERED TRANSPORTATION SYSTEMS**

The purpose of this research is to further the state-of-the-art of energy management in electrically powered transportation systems. Inherent in this objective is the determination of the relationships between the energy consumption of electric vehicles and their design capabilities and operating practices. Through this understanding, energy management strategies may be evaluated within a cost-benefit framework. The objectives of the work are: 1) To develop a realistic computer-based simulation model of energy consumption and cost in electric-powered transportation systems. This model will incorporate and link together the following three modules: (a) Train Performance Programs; (b) Energy Consumption Simulation; (c) Energy Cost Simulation. The advantage of this approach lies in its flexibility as it is anticipated that this technique will be able to accommodate any present or future system. 2) To develop strategies and guidelines for increasing the energy efficiency of electrically powered transportation systems. Used by the transit operators and designers, these guidelines would be applied to the modification of present systems and the construction of new ones. The strategies will be evaluated within the framework of the simulation model, and validated through application to selected real-world systems.

PERFORMING AGENCY: Carnegie-Mellon University, Department of Mechanical Engineering  
 INVESTIGATOR: Rice, RA  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Hopkins, JB

Contract DOT-OS-60129

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$95,840

ACKNOWLEDGMENT: DOT

17 045821

**COMPUTER-BASED RAILROAD NETWORK MODEL**

The objective of this project is the development of a computer based railroad network model which will be capable of facilitating the analyses of, and providing insights into the potential impacts of alternative public policies aimed at plant and/or corporate rationalization of the railroad industry. Outputs of primary interest will include rates of plant utilization, revenue generation, estimated costs and probable viability, all analyzed on a segment-by-segment basis. Additional modifications to be completed April 1976.

PERFORMING AGENCY: International Business Machines Corporation  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Bouve, T (Tel 202-426-2920)

Contract DOT-FR-40012  
STATUS: Active NOTICE DATE: Feb. 1976 START DATE: Oct. 1973 COMPLETION DATE: June 1976 TOTAL FUNDS: \$1,400,000

ACKNOWLEDGMENT: FRA

17 058277

**INTERMODAL MANAGEMENT INFORMATION SYSTEM, PHASE I**

Two management systems will be developed as part of the Intermodal Freight Program. These two systems will provide accurate and timely information to control costs, improve profitability, and assure service. Extensive use will be made of exception reporting to highlight problem areas requiring attention. Also, information will be assembled to facilitate advanced planning such as modeling. Phase I now in progress, will develop the general design of a specialized management information system which will improve intermodal operations in the areas of driver assignment, blocking policies, equipment inventory control, equipment distribution and planning, billing practices, sales and marketing. Phase II will cover completion of development under a separate future contract.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Bourque, WL (Tel (202)426-2608)

Contract DOT-FR-65101  
STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$76,000

ACKNOWLEDGMENT: FRA

17 080332

**RAILWAY TERMINAL SIMULATION MODELING**

A simulation model is being developed for a railway terminal under the control of Terminal Management Information Service (TMIS). It will be used to investigate methods in which TMIS can be used to improve terminal performance. Data will be used from the Vancouver Terminal of CP Rail. /RTAC/

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 5.30.74  
INVESTIGATOR: MacEwen, GH  
SPONSORING AGENCY: Canadian Pacific; Ministry of Transport, Canada, Transportation Development Agency; Queen's University, Canada

STATUS: Suspended NOTICE DATE: Feb. 1977 START DATE: June 1974

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

17 099386

**RAIL SAFETY INFORMATION SYSTEM**

This computer system contains carrier originated accident and exposure data, government originated inspection data on track, equipment, signals, operating practices and hazardous materials and, in addition, the national railroad-highway crossing inventory is part of the system. The system is used for report production and research.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Systems Analysis and Program Development  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: George, BF (Tel (202)755-9263)

STATUS: Active NOTICE DATE: Jan. 1977

ACKNOWLEDGMENT: FRA

17 099399

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM. PHASE I. TASK 2--DEVELOPMENT OF CAR UTILIZATION DEFINITION AND MEASUREMENT**

Develop a definition of freight car utilization consistent with railroad industry and program objectives. The definition should recognize the need for both physical and economic measures and for their appropriate interaction. Develop a set of utilization measures consistent with this definition, and the specifications for the data necessary to support these measures. Implement these measures in a demonstration project to assess to costs and benefits of the use of such a utilization measurement system in managing rail operations.

For further information on related studies see also RRS 099398 Section 26A, 099400 17A, 099401 17A, 099402 24A, 099403 21A.

PERFORMING AGENCY: Association of American Railroads  
INVESTIGATOR: Bryant, AH (Tel 415-3621212)  
SPONSORING AGENCY: Association of American Railroads  
RESPONSIBLE INDIVIDUAL: Leilich, GM (Tel (202)293-5018)

STATUS: Active NOTICE DATE: July 1976 START DATE: 1975 COMPLETION DATE: July 1977

ACKNOWLEDGMENT: AAR

17 099400

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM. PHASE I. TASK 3--CAR CYCLE ANALYSIS**

Draw a statistically based sample, collect car movement data using car location messages (CLM) and other sources, and analyze the movements of the sample cars to develop representative car cycle profiles for selected car type-commodity combinations. An industry task force will be appointed to assess the car cycle data. The objects of the task are to identify specific car utilization problems which will suggest corrective action by railroads and/or shippers, and to form a basis for recommendations for future car utilization program tasks.

For further information on related studies see also RRS 099398 Section 26A, 099399 17A, 099401 17A, 099402 24A, 099403 21A.

PERFORMING AGENCY: Association of American Railroads  
INVESTIGATOR: West, JB (Tel 415-6321212X21016)  
SPONSORING AGENCY: Association of American Railroads  
RESPONSIBLE INDIVIDUAL: Leilich, GM (Tel (202)293-5018)

STATUS: Active NOTICE DATE: July 1976 START DATE: 1975 COMPLETION DATE: July 1977

ACKNOWLEDGMENT: AAR

17 099401

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM. PHASE I. TASK 4--RECOMMENDED FREIGHT CAR MANAGEMENT AND CONTROL SYSTEMS**

An industry task force will be appointed to assist FRA in developing and formulating a research, development and demonstration program for railroad car management systems. Such a task force will include members knowledgeable in railroad computer systems, railroad operations, and the planning, control and evaluation aspects of freight car management. The FRA program will be an integral part of, and closely coordinated with, the car utilization program.

For further information on related studies see also RRS 099398 Section 26A, 099399 17A, 099400 17A, 099402 24A, 099403 21A.

PERFORMING AGENCY: Association of American Railroads  
INVESTIGATOR: Jones, JL (Tel 404-688-0800 X-395)  
SPONSORING AGENCY: Association of American Railroads  
RESPONSIBLE INDIVIDUAL: Leilich, GM (Tel (202)293-5018)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975 COMPLETION DATE: July 1977

ACKNOWLEDGMENT: AAR

17 099419

**FINANCIAL ACCOUNTING AND REPORTING ELEMENTS (FARE), TASK V**

Under this phase of the FARE project, additional effort to develop management information systems, using the FARE data base will be undertaken. Requirements for improvement management information-handling capabilities will be assessed, and concepts for a standardized, integrated management information system will be designed for sample operations. In addition a computer-oriented processing plan for FARE external reporting will be designed.

PERFORMING AGENCY: Andersen (Arthur) and Company  
SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Pierce, RE (Tel (202) 426-9274)

IT-06-0094

STATUS: Active NOTICE DATE: Aug. 1976 TOTAL FUNDS: \$860,000

ACKNOWLEDGMENT: UMTA

17 099438

**CARGO DATA INTERCHANGE SYSTEM (CARDIS)**

Develop the necessary standard codes and procedures to allow interchange of shipping information in machine readable form among the parties involved in domestic and international commerce: shippers, carriers, forwarders, banks, insurance companies, etc. Define industry and Government requirements, design and test an experimental system present draft standards at domestic and International forums. The CARDIS Program is currently undergoing an intensive review to: (1) analyze and review what has been done to date; and (2) develop policy direction for the technical design and implementation of a proposed CARDIS System, with special attention paid to cost/benefits.

## REFERENCES:

CARDIS Legal, Security, Output, and Foreign Data Element Requirements, National Committee on International Trade Documentation, June 1976

General Systems Specification, Gen Program Spec, Ref Manual & Gen Commun Spec for Prototype Elect Data Interchange Syst, Transportation Data Coordinating Committee, Final Report, Apr. 1976, PB-252937, 936 & 938

Experimental Test Concept for a CARDIS Computer Sciences Corporation, Volumes 1 & 2, Apr. 1976, PB-256822 & 823

PERFORMING AGENCY: Transportation Data Coordinating Committee; National Committee on Intl Trade Documentation; Computer Sciences Corporation

INVESTIGATOR: Carley, J (Tel 202-293-5514) Hemley, E (Tel 212-687-6261) Ruthling, C (Tel 703-533-8877)

SPONSORING AGENCY: Office of Environment, Safety and Consumer Affairs, Office of Facilitation

RESPONSIBLE INDIVIDUAL: Ronayne, M (Tel 202-4264317)

Contract DOT-PS-50017

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1974

ACKNOWLEDGMENT: DOT

17 129722

**GTW CAR CONTROL AND ACCOUNTING SYSTEM**

Participate in the Grand Trunk Western "RAILS" computerized tele-processing car control and accounting system to permit incorporation of additional features to allow simulation. Project will serve as a prototype interface between a large terminal information and management system and a railroad-level system.

## REFERENCES:

Detailed Functional Specifications for the Rails System Grand Trunk Western Railroad Company, June 1975

PERFORMING AGENCY: Grand Trunk Western Railroad

INVESTIGATOR: Tischler, H

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)

Contract DOT-FR-4-5020

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 COMPLETION DATE: June 1977 TOTAL FUNDS: \$1,000,000

ACKNOWLEDGMENT: FRA

17 138526

**MISSOURI PACIFIC'S COMPUTERIZED FREIGHT CAR SCHEDULING SYSTEM**

To develop and implement an automated freight car scheduling system. A prototype capability will first be developed. This research and demonstration project will establish the feasibility and determine the operational benefits of automated freight car scheduling. The project will provide considerable impetus to interline freight car scheduling reports and demonstrations will be made available to the railroad industry and the procedures, computer programs and related documentation of MoPac's Transportation Control System including the automated freight car scheduling system will be made available to interested railroads.

See also 21A 044569.

## REFERENCES:

State-of-the-Art Survey Apr. 1976

Project Work Plan Mar. 1976

PERFORMING AGENCY: Missouri Pacific Railroad

INVESTIGATOR: Sines, GS

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)

Contract DOT-FR-65139

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1975 COMPLETION DATE: Feb. 1979 TOTAL FUNDS: \$5,500,000

ACKNOWLEDGMENT: FRA

17 139172

**FLOW MANAGEMENT AND CONTROL**

Improved transportation network and control analyses can have broad multi-modal application and will assist the entire transportation community in achieving efficient flow management for existing and proposed systems.

Contract not yet awarded.

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202) 426-9364)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1977

ACKNOWLEDGMENT: OST

17 147736

**COLLABORATIVE U.S.-U.S.S.R. RESEARCH IN THE APPLICATION OF COMPUTERS TO THE MANAGEMENT OF LARGE CITIES**

This activity continues work previously supported by NSF grant DCR 74-08921 A01. This project is for the support of U.S. efforts in a joint U.S.-U.S.S.R. Program in the application of computers to management of large cities. This project area is part of a broad cooperative program in the application of computers to management being conducted as part of the U.S.-U.S.S.R. Agreement on Scientific and Technical Cooperation. Project activities supported by this grant relate to municipal government systems, municipal data-processing systems and resources, management systems for urban passenger transportation, urban goods distribution and municipal management information systems. The specific forms of cooperation include the preparation of joint reports, meetings of specialists from both countries for familiarization with ongoing work and for joint project activities, working seminars and conferences on selected topics, and exchange of information and materials related to project activities.

PERFORMING AGENCY: Columbia University, New York, School of Business

INVESTIGATOR: Savas, ES

SPONSORING AGENCY: National Science Foundation, Division of Math and Computer Science, MCS74-08921 A02

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: June 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$148,200

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSR 443 2)

17 147741

**AN EDUCATIONAL LABORATORY OF INTERACTIVE  
COMPUTER GRAPHICS IN TRANSPORTATION PLANNING**

It is proposed to establish at Princeton a graduate-undergraduate laboratory for teaching the use of the interactive computer graphics in transportation planning and systems analysis in connection with an already existing course on Urban Transportation Planning. A high-level interactive language (APL and APL-graphics) will be employed which is amenable to the use of large data banks and modeling techniques. Because of decreasing costs of hardware and development of software, it is forecast that computer graphics will have greatly increased use in the next decade. The primary objective is not to provide packaged material, but to use APL as an educational tool which can be adopted for operational use. Thus it is expected to create a new educational approach for transportation planners and systems analysts and to generate, evaluate, and distribute new instructional materials. Collaboration will be made with the Trenton Transit Study and the Northern New Jersey Commuter Rail Study, supported by DOT. The principal outputs will be a general-purpose data file system on transportation planning, selected mathematical models and a manual covering instructional techniques and example problems to be used in course development. Evaluation will be via student feedback and short courses development. It also is expected to secure the cooperation of several other universities in testing when the material is more fully developed. Dissemination of results will also be through the Task Force on Interactive Graphics of the Highway Research Board, of which Dr. Lion is a member, through the University Research and Training Program of the Urban Mass Transportation Administration, and the University Research Program of the Office of the Secretary, DOT.

PERFORMING AGENCY: Princeton University, School of Engineering and Applied Science

INVESTIGATOR: Lion, PM

SPONSORING AGENCY: National Science Foundation, Division of Higher Education in Science, HES74-21830

STATUS: Active NOTICE DATE: May 1976 START DATE: Nov. 1975 COMPLETION DATE: Oct. 1976 TOTAL FUNDS: \$43,050

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSA 154 1)

17 148331

**FEASIBILITY OF AND DESIGN OF COST EFFECTIVE  
COMPUTER BASED INFORMATION SYSTEMS TO INCREASE  
PRODUCTIVITY OF PRESENT AND FUTURE URBAN  
TRANSPORTATION SYSTEMS**

This research shall analyze potential benefits and associated costs of

improving information systems for a range of urban modes including bus, rail, carpool, and vanpool as well as air. In order to limit the scope of the research to manageable proportions, the project will particularly focus on an investigation of the feasibility of providing information to urban transit riders by means of telephone accessed computer aided information systems. Results of this research are expected to identify those information system configurations with the highest potential payoff which warrant further development of demonstration. The analysis will be conducted within a cost-benefit framework. In addition to assessing the applications of computer technology, manually operated telephone information systems and simpler means (maps or charts) will be briefly evaluated. Costs for each system will be examined in light of the potential transit demand. The research is not intended to be a theoretical study developed in isolation from actual transit information operation. Rather, it will survey selected transit properties to obtain first hand experience on performance of current information systems and their potential for modification/deployment to better meet transit information needs.

PERFORMING AGENCY: Purdue University, Department of Aeronautics and Astronautics

INVESTIGATOR: Drake, JW

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Durham, JS

Contract DOT-OS-60148

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$69,755

ACKNOWLEDGMENT: Allan (Ian) Limited

17 148350

**EMPLOYEE INFORMATION SYSTEM**

To review and analyze for validity and usefulness currently available railroad employee wage and employee operating statistics and to develop an employee information system that will consist of valid and useful data from currently available sources in a form readily transferable to research and publication. Preliminary productivity measurements will be developed and recommended to the FRA.

PERFORMING AGENCY: Booz-Allen Applied Research, Incorporated

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Collins, DM (Tel (202)426-2608)

Contract DOT-FR-T5164

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$69,768

ACKNOWLEDGMENT: FRA

18 080324

**THE RAILWAY FREIGHT RATE ISSUE**

The historical development of the railway freight rates in Canada is traced to provide the basis for explaining the complex roles played by freight rates and their evolution from an economic function to a sociological or political phenomenon. The inhibiting effects on the development of sound transportation and regional development policies are also analysed. /RTAC/

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
 INVESTIGATOR: Darling, H  
 SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

18 099595

**DETERMINATION OF UNIT MAINTENANCE COSTS FOR INTERMODAL FLATCARS**

The objective of this project is to determine accurately the maintenance cost per mile of intermodal flatcars operating in dedicated service between city pairs. The method used is to operate six specially-identified cars between Chicago and New Orleans on the Illinois Central Gulf Railroad. All repairs will be tabulated through the AAR Data Exchange System, and the mileage for each car will be recorded on an axle-mounted odometer. Pre-test and post-test measurements of critical components will be made in order to project their useful life.

PERFORMING AGENCY: Trailer Train Company  
 INVESTIGATOR: Greenfield, LP (Tel 312-786-1200)  
 SPONSORING AGENCY: Trailer Train Company

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: July 1975 COMPLETION DATE: July 1976

ACKNOWLEDGMENT: Trailer Train Company

18 129705

**RAIL INDUSTRY COST ANALYSIS**

This program develops methods to determine investment and operating cost changes associated with change in rail transportation activity and for individual rail movements. The application of these sophisticated cost control techniques to the rail industry will contribute to the efficiency and effectiveness of the railroads.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development  
 RESPONSIBLE INDIVIDUAL: Cantey, W

STATUS: Proposed NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

18 129724

**FREIGHT CAR AND LOCOMOTIVE COSTING**

Develop a set of methodologies and procedures for use in estimating the nature of cost and its variability in purchasing, maintaining, and operating freight cars and locomotives with application to pricing control and other management purposes.

PERFORMING AGENCY: Peat, Marwick, Mitchell and Company; Southern Railway System; Reebie (Robert) and Associates, Incorporated  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Lawler, JD (Tel 202-426-0771)

Contract DOT-FR-55055

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1975 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$485,021

ACKNOWLEDGMENT: FRA

18 129725

**EFFECTIVE UTILIZATION OF WORK FORCE**

Conduct research in the economic factors critical to effective utilization of the railroad work force. Factors to be included are employee compensation, effect of working conditions on employee productivity, investment in

training/experience, effects on employment of line abandonments, employee willingness to relocate, etc.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development  
 RESPONSIBLE INDIVIDUAL: Collins, DM (Tel 202-426-0771)

STATUS: Active NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

18 138472

**EFFECTS OF PEAK/OFF-PEAK DEMAND ON COSTING OF RAILWAY SERVICES**

The impact of the peak and off-peak demand for rail transportation service on the cost components of the capacity investment decision will be analyzed. This becomes particularly important in view of the recognized need of major Canadian railways for additional capital for capacity expansion.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
 INVESTIGATOR: Bernard, JT Hartwick, JM  
 SPONSORING AGENCY: Canadian National Railways; Canadian Institute of Guided Ground Transport

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: CIGGT

18 138474

**LONG-TERM IMPACT OF REPLACEMENT VALUE COSTING**

The objective of the study is to enumerate, illustrate, and quantify in general terms, the advantages and disadvantages of replacement value costing. The effect of RVC principles exercised over a sustained period will be examined with respect to marketing as affected by the "floorprice", cash flow generation, discounted cash flow analysis debt service implications and macroeconomic consequences for four scenarios: generally increasing capital asset prices, generally decreasing capital asset prices, fluctuating asset prices and constant price levels.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
 INVESTIGATOR: Lake, RW  
 SPONSORING AGENCY: Canadian National Railways

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1976 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: CIGGT

18 138480

**CAPITAL NEEDS STUDY--DEFERRED MAINTENANCE**

To estimate the deferred maintenance of the U.S. Class I railroads as required under section 504 of the Railroad Revitalization and Regulatory Reform Act of 1976.

Subcontracted to Peat, Marwick, Mitchell and Co. Sponsored by the Office of Rail Economics and Policy Development of FRA.

PERFORMING AGENCY: Dyer (Thomas K), Incorporated  
 INVESTIGATOR: Dyer, TK (Tel (617) 862-2075)  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Mewkirk, JL (Tel (202) 426-0771)

Contract DOT-FR-65153 Task 2

STATUS: Active NOTICE DATE: July 1976 START DATE: May 1976 TOTAL FUNDS: \$150,000

ACKNOWLEDGMENT: FRA

18 138512

**ACCESSORIAL SERVICES COSTING METHODOLOGY**

To develop, test and justify a set of methodologies and procedures to be used for estimating the costs of providing, maintaining and operating railroad accessorial services and their application to pricing, control, investment and other management purposes.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Lawler, JD (Tel (202) 426-0771)

Contract DOT-FR-5168

STATUS: Proposed NOTICE DATE: July 1976 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

**18 138513**

**TRAIN OPERATION AND CONTROL COSTING  
METHODOLOGY**

To develop, test, and justify a set of methodologies and procedures to be used for estimating the costs of providing, maintaining and operating train operating and control facilities and their application to pricing, control, investment and other management purposes.

PERFORMING AGENCY: Young (Arthur) and Company

INVESTIGATOR: Kerridge, J (Tel (202) 785-4747)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Lawler, JD (Tel (202) 426-0771)

Contract DOT-FR-65141

STATUS: Active NOTICE DATE: July 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$241,175

ACKNOWLEDGMENT: FRA

**18 138514**

**GENERAL AND ADMINISTRATIVE SERVICES COSTING  
METHODOLOGY**

To develop, test, and justify a set of methodologies and procedures to be used for estimating the economic costs of providing and maintaining railroad general administrative services and for management control and decision making.

Scanlan, J

PERFORMING AGENCY: Price Waterhouse and Company

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Lawler, JD (Tel (617)423-7330 x219)

Contract DOT-FR-5167

STATUS: Proposed NOTICE DATE: July 1976 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

**18 148332**

**PLANNING MODEL FOR HIGH ACCESSIBILITY URBAN  
CORRIDORS**

The primary objective of this research program is to develop a method for the planning and institution of capital and operational improvements in high accessibility urban transportation corridors. The corridor model allows a more detailed evaluation of a greater number of transportation alternatives than can be accomplished through conventional long-range planning techniques. The method is directed toward short (1 to 3 years) and medium range (4 to 10 years) planning horizons, within which the development and implementation of new facilities and major operations improvements typically occur. The method is designed to explore a wide range of new facility and operational options within a corridor and to evaluate these not only from the traditional standpoint of transportation user and system operator costs; but also to quantitatively assess community impacts such as land consumption, air and noise pollution, and national impacts such as energy use. A model for the planning of major transit improvements in densely developed urban corridors has been developed as an operational computer model. This model considers: Various forms of bus and rail transit, costs and environmental impacts, level of usage of new and existing facilities, and the levels-of-service offered by new and proposed transit services. This model is specifically designed to provide trade-off information so that the most cost-effective alternative, given a budget constraint and/or a specification of minimum levels-of-service to be offered, can be selected. The methodology is designed to use data which is readily available in urban transportation studies for large metropolitan areas. Sample corridor travel demand data was reduced from the Chicago Area Transportation Study's

household interview files, and all programs and procedures used in this analysis are being documented.

REFERENCES:

Development and Testing of a Transportation Planning Model for High Accessibility Urban Corridors, Final Rpt., Vol. 1, 1975

for High Accessibility Urban Corridors Final Rpt., Vol. 2, 1975

Urban Corridor Transportation Planning Model, Version 1 Morlok, EK; Akyilmaz, ML, 1974

Integration of the Urban Corridor Transportation Planning Model into the Urban Transportation Planning Process, Working Paper No. 10

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of Civil and Urban Engineering

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Weiner, E

Contract DOT-OS-40092

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$96,905

ACKNOWLEDGMENT: DOT

**18 148338**

**TRANSPORTATION/TELECOMMUNICATIONS TRADE OFF.  
METHODOLOGY FOR RURAL AREAS**

This project modified a multi-industry, multi-regional economic forecasting model. To investigate the alternative impacts of transportation or communications in rural areas. The methodology was illustrated using actual data from two example counties: Pitt County, N.C. and Indiana County, Pa. Investments in transportation were calculated by estimating cost, reductions in truck and rail transportation within the region.

REFERENCES:

Socioeconomic Impact of Investment in Transportation and Communication, Hilewick, C, NTIS, Aug. 1976

PERFORMING AGENCY: Fairfield University

INVESTIGATOR: Hilewick, C Deak, E Kohl, K Heinze, E

SPONSORING AGENCY: Urban Mass Transportation Administration; Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Paulhus, NG, Jr (Tel (202)426-4208)

Contract HUD H-2104R

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$150,000

ACKNOWLEDGMENT: DOT

**18 148354**

**CHEMICAL STABILIZATION FOR CONTROL OF DUST AND  
TRAFFIC EROSION**

The study will investigate the forces which will cause Specimens of a dune sand sprayed with chemicals were subjected to simulated wind velocities up to 145 km/h (90 mph). Specimens of compacted granitic soil treated with chemicals by either spraying or mixing were subjected to simulated traffic abrasion forces under simulated tire pressures up to 414 kPa (60 psi). Selected chemical treatments were subjected to various environmental-durability conditions including freeze-thaw cycles, wet-dry cycles, rain-dry cycles, and various curing temperatures. Based on the results of this laboratory testing, several chemical stabilizers were selected for use in a large-scale field applications. Eleven chemicals were sprayed on untraffickable areas to control dust and wind erosion. Five chemicals were sprayed on an unpaved road to control erosion and dust behind traffic. Three chemicals were also mixed with the surface of an unpaved road. Methods of field application and monitoring techniques including dust collection by a high-volume air sampler, dust fall collection in cups, and extraction tests are discussed. Preliminary comparisons of the chemical applications with themselves and with control sections, where water was used, are given. Evaluation will continue for approximately 12 months.

Sultan, HA (Arizona University) *Transportation Research Record* No. 593, 1976, pp 34-40, 2 Tab., 10 Ref.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport

INVESTIGATOR: Daub, M Lake, RW

SPONSORING AGENCY: Canadian National Railways; Canadian Transport Commission

STATUS: Active NOTICE DATE: Feb. 1977 COMPLETION DATE: Apr. 1977



ACKNOWLEDGMENT: Roads and Transportation Association of Canada

18 148357

**RAIL SYSTEM INVESTMENT ANALYSIS**

This study will assist in developing recommendations concerning future investments in the railroad system. The objectives of the project are to: Evaluate different categories of rail investments and identify logical priorities among alternative rail investment opportunities; develop a recommended approach for general application by the federal government in evaluating alternative investments of rail program funds; Provide railroad decision makers with a theoretically and practically sound approach for evaluating investments of company resources. The contractors have reviewed the approaches of 13 railroad companies to project evaluation, and obtained data on selected investment projects. Individual investments are being analyzed in detail to assess the rate of return which they will yield to the railroad, the rail industry and the national economy. The investments considered include roadway and route improvements, signals and communications projects, yard and terminal projects, and additions to rolling stock.

411 reports are to be published by U.S. D.O.T.

REFERENCES:

Rail System Investment Analysis: Literature Search Ernst & Ernst and Banks (RL) & Assoc.

Rail Investment Analysis: Description of the Railroad Investment Process, Ernst & Ernst and Banks (RL) & Assoc.

Rail System Investment Analysis: Financial Analysis of Sample Investment Projects., Ernst & Ernst and Banks (RL) & Assoc.

PERFORMING AGENCY: Ernst and Ernst; Banks (RL) and Associates, Incorporated

INVESTIGATOR: Robers, PD (Tel (202)296-8300) Lutes, GS French, P

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Harman, J (Tel (202)426-4214)

Contract DOT-OST-50097

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$339,000

ACKNOWLEDGMENT: Ernst and Ernst

**20 055810**

**TRANSPORTATION SYSTEM DEVELOPMENT FOR ALASKA**

This project is directed at the analysis of policy and transportation system development alternatives upon the economy of the State of Alaska as well as upon the performance of the intercity freight transportation networks. A macroeconomic model, previously developed by the Brookings Institution shall be adopted for use in representing the basic structure and interrelationships of the Alaskan economy. A transportation network simulation model shall also be developed as part of this effort which includes each of the major intercity freight carrying modal systems operating or expected or be operating in Alaska.

A recent Federal Railroad Administration study used the research demand forecasting models to predict Alaska Railroad freight flows by commodity type. Rail data was also used by the Canadian government in studying the feasibility of a Canadian railroad system extension to Alaska.

PERFORMING AGENCY: Alaska University, College

INVESTIGATOR: Pernela, L

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Swerdloff, CN

174500 ( 147959)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1973 COMPLETION DATE: Oct. 1976

ACKNOWLEDGMENT: TRAIS (PR# PUR-2-30685)

**20 058460**

**TRANSPORTATION REQUIREMENTS FOR COAL MOVEMENTS THROUGH 1985**

Develop and analyze rail and barge industry estimates of the total coal flows by 1985 and the equipment and facilities required to handle increased coal traffic. Critical system constraints that may hinder traffic growth will be determined and carrier solutions sought. The rail and barge industry planning processes to 1985 will also be examined and discussed.

**REFERENCES:**

Rail and Water Transportation Requirements for 1980 U.S. Coal Flows, IOCS, Cambridge, Mass., June 1976

PERFORMING AGENCY: Small Business Administration

INVESTIGATOR: Desai, S (Tel (617) 661-8700) Witten, J

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, OP-602

RESPONSIBLE INDIVIDUAL: Anderson, D 210 (Tel (617) 494-2752)

IA TSC-1000

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$135,000

ACKNOWLEDGMENT: TRAIS, OST

**20 058467**

**DATA REQUIREMENTS ON INTERCITY FREIGHT DEMAND PLANNING**

The objective is a critical review of present data sources and reporting methods. Emphasis is on the usefulness of the data in calibration and estimation of existing forms of demand models and recommendations on better sources or collection techniques for more effective forecasting of commodity flows. Data of primary concern are indications of shippers' choice; commodity attributes; production, consumption and pricing of commodities; and transportation attributes. A careful review of the form of the model and variables needed to predict modal choice by shippers is to be made. Various methods of data collection, processing, storage and retrieval and their related costs are to be evaluated for achieving the goals.

**REFERENCES:**

Design of a Structure and Data Analysis Scheme for Intercity Freight Demand Forecasting, Chung, C; Roberts, PO, CTS Rept. #75-15, 154 pp, Sept. 1975

A Commodity Attribute Data File for Use in Freight Transportation Studies, Samuelson, RA; Roberts, PO, CTS Rept. #75-20, 27 pp, Nov. 1975

Developing Freight Origin-Destination Data for Use in Freight Planning, Roberts, PO, CTS Rept. #76-3, Feb. 1976

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies, 82796

INVESTIGATOR: Roberts, PO (Tel (617) 253-7123)

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, OP-509

RESPONSIBLE INDIVIDUAL: Wright, DG (Tel (617) 494-2196)

Contract DOT-TSC-1005 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$38,000

ACKNOWLEDGMENT: TRAIS, Massachusetts Institute of Technology

**20 058473**

**AUTOMOTIVE SCRAPPAGE AND RECYCLING INDUSTRY STUDY**

This project will include a literature search of the industries associated with the recycling of automotive materials, the preparation of an overview of the automobile recycling industry, and the performance of in-depth studies on the aspects of the automobile recycling such as automobile shredding and the reclamation of rubber from the automobile.

PERFORMING AGENCY: H.H. Aerospace

INVESTIGATOR: Kaiser, R

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, OS-14

RESPONSIBLE INDIVIDUAL: Powel, SF (Tel (613)494-2124)

IA DOT-TSC-1028 (FFP)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975 TOTAL FUNDS: \$49,988

ACKNOWLEDGMENT: TRAIS, TSC

**20 058489**

**TRANSPORT OF SOLID COMMODITIES VIA FREIGHT PIPELINE**

Objectives are: (1) to explore the feasibility and viability of the freight pipeline as an effective mode of transporting solid commodities over long distances, and (2) if the conclusion of that exploration is positive, to evaluate the issues surrounding the freight pipeline. The research shall focus on evaluation of the concept through a technical and market feasibility study. In specific terms, the study is expected to quantify, as much as possible, the traffic, social, economic, energy, legal, regulatory, institutional, political, and environmental impacts of freight pipeline within the context of a number of varied, but possible, scenarios. STATUS: The types of "freight pipeline" examined were: 1) slurry pipeline--liquid medium mixed with transported commodity; 2) pneumatic pipeline--air medium mixed with transported commodity, and 3) capsule pipeline--containerized freight in either liquid (hydro) or gas (pneumatic) medium. Through actual utilization, slurry, pneumatic, and pneumo capsule pipeline were found to be technically feasible. Hydro capsule pipelines, have not yet demonstrated their reliability. Pneumo-capsule technology was selected for the indepth analysis of the economic feasibility of freight pipelines. Initial work in this area centered on identifying the markets that would be most suitable for penetration by pneumo-capsule technology; costs for these markets were ascertained. Generally, pneumo-capsule pipeline proves most feasible for total loads in excess of 5 million tons/year, and for distances greater than 500 miles. In investigating the possible demand for pneumo-capsule pipeline, the Chicago/Philadelphia corridor was selected for detailed demand analysis. Both aggregated techniques (using I.C.C. supplied cost functions) and disaggregated methods (using individual shipper cost functions) illustrated that for several types of commodities, the demand was substantial enough to consider construction.

**REFERENCES:**

A Comparison of the Work (Energy) Requirements of Line-haul Rail, Truck, and Piggyback Freight Transportation, Morlok, EK, Presented at Annual Meeting of TRB, Jan. 1976

Cost and Performance Characteristics of Rail, TOFC and Highway Intercity Freight Modes, Morlok, EL; Warner, JA, No Date

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of Civil and Environmental Engineering

INVESTIGATOR: Zandi, I

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Ryan, DC, Jr (Tel 202-4264208)

Contract DOT-OS-50119

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: May 1977 TOTAL FUNDS: \$130,529

ACKNOWLEDGMENT: TRAIS (PUR-50030), OST

20 058686

#### STUDY OF AUTOMOBILE MARKET DYNAMICS

To determine the effects on total sales of new cars upon the distribution by size-class and origin (foreign vs domestic) of alternative energy conservation policies, in-depth interviews were administered to seven hundred recent new-car buyers. Extensive income and demographic data were collected from the respondents along with information on the characteristics and patterns of use of currently-owned vehicles. Four policy options (on change, gasoline taxes, excise taxes proportional to fuel consumption and regulation of fuel economy) were explained to the respondents. For each policy option, respondents indicated how they thought their automobile purchases for the 1976-1980 time period would be affected in terms of vehicle size, origin, timing of purchase, etc.

#### REFERENCES:

Study of Automobile Market Dynamics Little (AD), Incorporated, Nov. 1976

PERFORMING AGENCY: Little (Arthur D), Incorporated

INVESTIGATOR: Morton, AS (Tel (617)864-5770)

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, OS-514

RESPONSIBLE INDIVIDUAL: Pollard, J (Tel (617)494-2127)

Contract DOT-TSC-1060 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$146,075

ACKNOWLEDGMENT: TRAIS

20 080313

#### FREIGHT CAR DEMAND INFORMATION AND FORECASTING RESEARCH PROJECT

To create a functional design of the elements and processes (system architecture) necessary for a technically advanced system to collect and predict shipper requests (orders for freight cars to load). Such a system must be operationally suitable and economically justifiable for use by individual Class I railroads as part of their system-wide empty freight car distribution activity.

#### REFERENCES:

Freight Car Demand Information and Forecasting Research Project. Phase I: Final Report, Mar. 1975

PERFORMING AGENCY: Association of American Railroads

INVESTIGATOR: Minger, WK (Tel (202) 293-5023)

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel 202-4262920)

Contract DOT-FR-30058

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1973 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$208,491

ACKNOWLEDGMENT: FRA

20 083440

#### AN ECONOMIC ANALYSIS OF PRESENT AND POTENTIAL TRADE BETWEEN ALASKA AND WASHINGTON

The project will identify present and future trade relationships between Alaska and Washington; identify characteristics of the distribution system; suggest innovations needed to improve the performance of the physical distribution system; and considering above, determine the composition of future trade. The investigation is designed to collect and analyze primary data of commodity movements; using the above information plus secondary data, project future trade flows; interview and analyze information on the physical distribution system from selected firms and government agencies involved in commerce between the two states. From these interviews, problem areas will be identified and analyzed and related to the effects on future trade composition.

See also RRIS 20A 099627.

PERFORMING AGENCY: Alaska University, College, Department of Agricultural Sciences

INVESTIGATOR: Thomas, WC

SPONSORING AGENCY: Department of Agriculture, ALK-274-5584

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1973

ACKNOWLEDGMENT: Current Research Information System (CRIS 0064860)

20 083479

#### IMPACT OF CHANGING TRANSPORTATION SYSTEMS ON LOCAL GRAIN AND FARM SUPPLY FIRMS

OBJECTIVES: Estimate quantities of grain that will move through country elevators and commercial channels in 1975 and 1980 by counties; estimate demand for feed and fertilizer. Project alternate changes in grain transportation; determine economic feasibility of alternative systems of grain movement from producers to destinations; determine effect of changes listed under C and D on number, size, type and location of country elevators and on local employment and services; determine consequences of projected transportation changes on distribution of feed and fertilizer; and develop guidelines which individual firms can use in investment and transportation decisions. APPROACH: Will obtain data through survey schedules, transportation rate information and published reports. Develop models which will give estimates by counties and geographic units, evaluate alternative modes of transportation, project changes, and generate least cost information for various situations. Iowa, Kansas and Nebraska will participate in objectives A, B, C, D, F, and G. Iowa and Nebraska will participate in objective E. Illinois will participate in objectives A, B, C, D, and E. PROGRESS REPORT: A case study of the impact of branch line abandonment has been completed and the results reported in a paper given before the annual meeting of the American Agricultural Economics Association. The study indicated that in the one area with access to water-truck combination for transport the impact of abandonment on agricultural marketing and production firms was very slight. Fertilizer firms appeared to be affected more than grain and feed firms. In a second area with no ready access to water transportation, abandonment reduced the rate of firm growth, retarded investment in facilities, and weakened the market for cash grain. Development of predictive models is continuing.

PERFORMING AGENCY: Illinois University, Urbana, Department of Agricultural Economics, ILL U-05-366

INVESTIGATOR: Hill, LD

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Illinois University, Urbana (CRIS 0064467), Smithsonian Science Information Exchange (gy 64467 1)

20 083481

#### SYSTEM ANALYSIS OF THE ECONOMICS OF GRAIN MARKETING

The purposes of this project are to: determine the effects of changing farm programs on the efficiency of the marketing, utilization, and distribution of grain and soybeans and their products; determine the implication of farm programs for shipping patterns and quantities shipped to foreign markets; and investigate the operation of the marketing systems as they affect the economics of physical distribution and processing of grains. APPROACH: The grain marketing system will be approximated by a spatial equilibrium model determining the optimum size, type, and number of firms. Relationships between prices and market structure will be analyzed using daily prices from Illinois elevators. The appropriateness of test weight standards of corn for communicating quality preferences will be evaluated. US price-support programs, export subsidies, OCC credit sales and inter-grain price relationships will be examined. Programs and policies of major importing countries and measurement of the incidence of trade restrictions will be evaluated for US exports. Export potentials for US grains will be estimated. PROGRESS REPORT: Work was concentrated in two areas appraisal of Sino-American trade prospects and direction of European integration. The results suggest that the United States has a good chance of becoming an important supplier of wheat, cotton, vegetable oils, and perhaps tobacco and coarse grains to China. A new basis for trade may be created through direct U.S. investments, joint undertakings, and the extension of most-favored-nation treatment to Chinese goods. The European Community is in a state of crisis and is confronted with three possibilities at this juncture. Regress into a free trade area with no common agricultural and economic policies. Stand still

and hold on to what it has achieved to date. Push ahead toward a federal economic and monetary union, with supranational institutions.

**REFERENCES:**

An Enlarged European Community and Agricultural Trade Policy Choices for Third Countries, Schmidt, SC, Journal of Agricultural Economics, Vol. 24, Vol. 1, pp 141-164, Jan. 1973

East-West Trade in Wheat: Present and Potential Schmidt, SC, Economic Planning, Vol. 9, No. 3-4, pp 3-24, May 1973

The Demand for On-Farm Heated-Air Grain Dryers Kau, P; Hill, LD, Illinois University, Dept of Agri Econ, Agri Expt Station, AERR 118, Jan. 1973

Test Weight as a Grading Factor for Shelled Corn Hall, G; Hill, LD, Illinois University, Dept of Agri Econ, Agri Expt Station, AERR 124, Sept. 1973

European Integration Where To? Schmidt, SC, Illinois Business Review, 31(10): 6-8, Nov. 1974

Test Weight Adjustment Based on Moisture Content and Mechanical Damage of Corn Kernels, Hall; Glenn; Hill, LD, American Society of Agricultural Engineers--Transactions, 17:3, pp 578-79, Feb. 1974

**PERFORMING AGENCY:** Illinois University, Urbana, Department of Agricultural Economics, ILLU-05-0315

**INVESTIGATOR:** Hill, LD Schmidt, SC Hieronymus, TA

**SPONSORING AGENCY:** Department of Agriculture

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** July 1971

**ACKNOWLEDGMENT:** Illinois University, Urbana (CRIS 0060066)

**20 083485**

**LOGISTICAL FACTORS INVOLVED IN DOMESTIC AND FOREIGN MARKETING OF IOWA'S GRAINS, LIVESTOCK AND MEATS**

**OBJECTIVES:** The project is to continue the investigation of patterns of transportation to domestic and foreign markets as a result of the grain transportation crisis of 1972-73 and current agricultural policy, and analyze and recommend possible changes in transportation regulations affecting the movements of Iowa's grains, oilseeds, livestock and meats. **APPROACH:** Recommendations for legislative changes will be determined by results of research underway on U.S. Department of Transportation contracts and reports to be submitted in September 1973. **PROGRESS REPORT:** Research on U.S. Department of Transportation project. "An Economic Analysis of Alternative Grain Transportation Systems: A Case Study." Writing manuscript on Executive Summary for above project and reviewing and editing Final Report Phase I of same. Arranged and attended series of research meetings on Livestock and Meat Transportation during October and November. Meetings with Task Force Groups on Iowa Railroad Problems. Initiated first phase of possible research project on container movements of grains from Iowa. Acted as coordinator of grain transportation research with College of Engineering research team working on D.O.T. Contract D.O.T.-OS 30106. "Integrated Analysis of Small Cities Intercity Transportation to Facilitate the Achievement of Regional Goals."

**REFERENCES:**

An Economic Analysis of Alternative Grain Transportation Systems: A Case Study, Department of Transportation, Exec. Summary, FRA-OE-73-4, Nov. 1973

**PERFORMING AGENCY:** Iowa State University, Ames, Department of Industrial Administration, IOW02003

**INVESTIGATOR:** Thompson, WH

**SPONSORING AGENCY:** Department of Agriculture; Iowa, State of

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** July 1973

**ACKNOWLEDGMENT:** Iowa State University, Ames (CRIS 0064289)

**20 083488**

**IMPACT OF CHANGING TRANSPORTATION SYSTEMS ON LOCAL GRAINS AND FARM SUPPLY FIRMS**

The objectives of this project are to: estimate quantities of grain that will move through country elevators and commercial channels in 1975 and 1980 by counties; estimate demand for feed and fertilizer; project alternate changes in grain transportation; determine economic feasibility of alternative systems of grain movement from producers to destinations; determine effect of changes on number, size, type, and location of country elevators and on local employment and services; determine consequences of projected transportation changes on distribution of feed and fertilizer; and develop

guidelines which individual firms can use in investment and transportation decisions.

**REFERENCES:**

Kansas 1966-71 Livestock-Feed Balances Doxtader, MW; McCoy, JH  
Projected 1980 Kansas Livestock-Feed Balances Doxtader, MW; McCoy, JH

Market Flow Patterns for Wheat, Milo, Corn and Soybeans from Kansas Origins, 1971-72, Sheldon, R; Sorenson, LO

**PERFORMING AGENCY:** Kansas State University, Agricultural Economics Department, KAN00843

**INVESTIGATOR:** Sorenson, LO McCoy, JH

**SPONSORING AGENCY:** Department of Agriculture, 0061435 KAN00843

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** June 1971

**ACKNOWLEDGMENT:** Kansas State University (CRIS 0061435), Smithsonian Science Information Exchange (GY 61435 3)

**20 083507**

**PLAN AND PROMOTE IMPROVED WHOLESALE FOOD MARKETING FACILITIES AND METHODS IN NEW ORLEANS, LOUISIANA**

The objective of this project is to improve the wholesale food marketing facilities in New Orleans, Louisiana. The approach will include the following: Determine the number and types of food firms including their locations and tenure status, methods of receipts, volumes handled, selected costs of operations, and adequacy of present facilities in terms of efficiency, organization, and space use; Formulate plans for those firms needing new facilities and recommend the type of facility which will help reduce marketing costs; Evaluate acceptable sites in relation to proximity to center of distribution and consumption, accessibility to truck and rail transportation and convenience for buyers; Develop a master plan for the site and determine the total investment for land and facilities and management needs, and estimate the annual revenue required to operate the proposed facilities; and Compare selected costs in the present market with those in the proposed facilities. The progress report will include a plan for a new regional wholesale food distribution center for New Orleans was developed and presented to local officials and food wholesalers at a public meeting in New Orleans. It calls for the initial development of \$13.4 million worth of facilities on 92 acres of land to meet the immediate needs of 54 local food wholesalers. The center is designed to be expanded to more than twice its initial size to meet future needs. As much as \$1.5 million could be saved at the outset each year in the handling and distribution of all kinds of food products. A site for constructing the initial facility has been purchased by the city and plans are underway for its development. A report of the study is written and has been submitted for publication.

**REFERENCES:**

Central Refrigeration System for A Proposed Food Distribution Center in New Orleans, Louisiana, Taylor, EG, Agricultural Research Service, NE-26, Aug. 1973

**PERFORMING AGENCY:** Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15863-016

**INVESTIGATOR:** Taylor, EG Brasfield, KH

**SPONSORING AGENCY:** Department of Agriculture

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** June 1973

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0040306)

**20 083508**

**PLAN AND PROMOTE IMPROVED WHOLESALE FOOD MARKETING FACILITIES AND METHODS IN DALLAS, TEXAS**

The objective of this project is to improve the wholesale food marketing facilities in Dallas, Texas. The approach will include the following: Determine the number and types of food firms including their locations and tenure status, methods of receipts, volumes handled, selected costs of operations, and adequacy of present facilities in terms of efficiency, organization, and space use; Formulate plans for those firms needing new facilities and recommend the type of facility which will help reduce marketing costs; Evaluate acceptable sites in relation to proximity to center of distribution and consumption, accessibility to truck and rail transportation and convenience for buyers; and develop a master plan for the site and determine the total investment for land and facilities and management needs, and estimate the annual revenue required to operate the proposed facilities. The progress report will include plans for improved wholesale food facilities

in Dallas Texas, have been completed for firms facing displacement by highway or other urban renewal plans. Twenty-eight firms handling over 399,000 tons of good products annually are included. Fifteen specialized buildings arranged on 58 acres of land will meet their needs in the initial development. Future development of a farmers' market and allied industries would add another 50 acres bringing the total land area needed to over 100 acres. The total cost for the new center would be about \$11.3 million. Highlights of the study were presented at a public meeting in Dallas in September 1973. Since that time, meetings have been held with food industry representatives in Dallas to discuss implementation of the study and recommendations were drafted and are in the process of publication.

## REFERENCES:

Central Refrigeration System for a Proposed Food Distribution Center in Dallas, Texas, Overheim, RK, Agricultural Research Service, NE-27, Aug. 1973

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15863-002

INVESTIGATOR: Overheim, RK Brasfield, KH

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1973

ACKNOWLEDGMENT: Current Research Information System (CRIS 0040307)

20 083526

#### IMPACT OF CHANGING TRANSPORTATION SYSTEMS ON LOCAL GRAIN AND FARM SUPPLY FIRMS

The objectives of this project are to: estimate quantities of grain that will move through country elevators and will give estimates by counties and geographic units, evaluate alternative modes of transportation, project situations will be developed. Dr. J. R. Felton, has been analyzing the supply-demand aspects of rail grain shipments. Included in his findings is a proposed market allocation system for freight cars. The system would substitute market pressures for present authoritarian car allocation methods and would render car shortages possible in an economic sense.

## REFERENCES:

Economic Effects of Abandoning Branch Rail Lines Anderson, DG; Gaibler, FD, Nebraska Farm, Ranch and Home Quarterly, Vol. 22, No. 2 pp 20-22, June 1975

Economic Consequences of Abandoning Branch-Line Railroads Gaibler, FD; Anderson, DG, Feedstuffs, Vol. 47, No. 10, p 36, Mar. 1975

A Systems Analysis of Grain Marketing Networks Using a Spatial Equilibrium Model, Berglund, M, Univ of Nebr., Dept of Agricultural Economics, Staff Paper 1973-16, 20 pp, 1973

Externalities and Freight Car Supply in the U.S. Rail Network, Berglund, M, Univ of Nebr, Dept of Agricultural Economics, Staff Paper 1975-#2, 10 pp, 1975

PERFORMING AGENCY: Nebraska University, Lincoln, Department of Agricultural Economics, NEB-10-062

INVESTIGATOR: Anderson, DG

SPONSORING AGENCY: Department of Agriculture; Nebraska University, Lincoln, Agricultural Experiment Station

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Nebraska University, Lincoln (CRIS 0060519), Smithsonian Science Information Exchange

20 083533

#### SYSTEMS ANALYSIS OF THE ECONOMICS OF GRAIN MARKETING

The objectives are: (1) Determine the effects of changing farm programs on the efficiency of the Marketing, Utilization and Distribution of Grain and Soybeans and their products; (2) Study changes in price relationships as a consequence of differences in location and production resulting from farm programs; (3) Ascertain changes in the relative utilization of different grains in the feeding of livestock and other uses; (4) Determine the implications of farm programs for shipping patterns and quantities shipped to foreign market; (5) Investigate the operations of marketing systems as they affect: (a) The economics of physical distribution and processing of grains. (b) Managerial decision-making by grain marketing firms. Secondary data will be supplemented by station experimental data, farm records, previous studies and from agencies and individual firms involved in various phases of the grain industry. Time series data will be analyzed and related to the long and short run demand for grain. U.S. price support programs, export

subsidies, C.C.C. sales and inter-grain price relationships will be analyzed. Programs and policies of importing countries will be analyzed from standpoint of their relationship to U.S. exports. A spatial equilibrium model determining the optimum size, type, and number of firms will be developed. Existing decision-making models will be adapted and improved or new ones will be developed through studying operating parameters and external constraints of marketing firms. PROGRESS REPORT: Cost of alternative move-store activities for small grains from the field to a central market were estimated. Included in the analysis were farm trucks, semi-trailer trucks, single car, multiple car, and unit train rates, farm storage, and elevators of 100,000, 400,000, and 1,500,000 bushels storage capacity. Resultant budgets for alternative movements of grain from field to a central market were ranked from 1 to 58 by total cost and compared with the most commonly used system. These budgets ranged from 27.97 cents per bushel to 52.97 cents with the typical system estimated at 41.84 cents. Limitations on some least cost budgets and justifications for more costly budgets were given. A Master's thesis was completed on marketing strategies of a sample of central N.D. grain farmers. This study indicated that country elevators were the predominant grain sales outlet.

## REFERENCES:

The Cost of Seed Processing Anderson, DE, NDSU, Agricultural Experiment Station, Nov. 1973

Grain Marketing Methods in the United States: Theory Assumptions and Approach, Anderson, DE, NDSU, Agricultural Experiment Station, AA-EA-CAES-WAEA Conf Paper, Aug. 1973

A Budget Analysis of the Logistics System for North Dakota Small Grains, Jensen, RC, NDSU, Department of Agricultural Economics, Unpublished MS Thesis, May 1974

North Dakota Farmers Grain Marketing Strategies Bedker, GM, NDSU, Department of Agricultural Economics, Unpublished MS Thesis, Mar. 1974

North Dakota Farmers Grain Marketing Practices Bedker, GM; Anderson, DE, NDSU, Agricultural Experiment Station, North Dakota Farm Research, Oct. 1974

PERFORMING AGENCY: North Dakota State University, Department of Agricultural Economics, ND01354

INVESTIGATOR: Anderson, DE

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: North Dakota State University (CRIS 0060238)

20 099625

#### SYSTEMS ANALYSIS OF THE ECONOMICS OF GRAIN MARKETING

Determine the effects of changing farm programs on the efficiency of Marketing, Utilization and Distribution of Grain and Soybeans and their products; Study changes in price relationships as a consequence of differences in location and production resulting from farm programs. Ascertain changes in the relative utilization of different grains in the feeding livestock and other uses. Determine the implications of farm programs for shipping patterns and quantities shipped to foreign markets.

Secondary data will be supplemented by station experimental data, farm records, previous studies and from agencies and individual firms involved in various phases of the grain industry. The grain marketing system will be approximated by a spatial equilibrium model determining the optimum size, type, and number of firms. Projections of grain production and consumption will be made. Time series data will be analyzed and related to the long and short run demand. U.S. price-support programs, export subsidies, C.C.C. sales and inter-grain price relationships will be analyzed. Programs and policies of importing countries and measurement of the incidence of trade restrictions will be evaluated for U.S. exports. Export potentials for U.S. grain will be estimated.

A survey was made of multiple rail car loading country elevators and sub-terminals in Southern Minnesota to determine how new multiple rail car export rates are influencing grain marketing patterns and the structure of the country elevator industry. The results were summarized and a manuscript prepared. In mid-1974, 19 elevators in Southern Minnesota were operating facilities capable of loading unit grain trains. Several were under construction and at least three more elevators with unit train capability will be built in 1975. These elevators were shipping sizeable quantities of corn and soybeans by rail to the Gulf and Duluth-Superior for export. Unit train grain shipments from country points to export ports have several advantages favoring their continued heavy use. One railroad has also announced its intentions to extend lower multiple-car rates on domestic shipments to

terminal markets and processors. This will give an advantage to country shippers that can ship in large quantities.

**REFERENCES:**

Grain Transportation and Sub-Terminals Dahl, RP, Farmers Elevator Association of Minnesota, Minneapolis, Speech, Feb. 1974

**PERFORMING AGENCY:** Minnesota University, Saint Paul, Department of Agricultural and Applied Economics

**INVESTIGATOR:** Dahl, RP

**SPONSORING AGENCY:** Department of Agriculture, MIN-14-069

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** July 1971

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0060487)

**20 099628**

**APPRAISAL OF CAPABILITY OF TRANSPORTATION SYSTEM TO MEET NEEDS OF AGRICULTURE AND RURAL AREAS**

Appraise the effectiveness of the rural transportation system to meet incurred demand for services and the capacity of the transportation system to economically move inputs under a policy of full production. Quantify effects of sharply increased exports on farm product storage and transportation facilities and identify long-run structural problems affecting the capability of the transportation system to serve rural areas.

Utilize secondary data sources and interview local, state and Federal officials to obtain an assessment of the capability of the transportation system to meet agriculture's need. Models and other appropriate analytical tools are basic to making systematic appraisal of the data upon which to draw conclusions.

An interim report was submitted to the Congress showing that extraordinary demands for grain and soybean transportation in 1973 were met. The hardships and costs of meeting the demands were discussed. Some of the long-run structural problems of the transportation industry were identified and data availability for analysis of the problems assessed. Held a workshop on rural transportation problems and assisted in planning and conducting four Extension Workshops concerning the activities generated by the Regional Rail Reorganization Act of 1973.

**REFERENCES:**

Transportation in Rural America: An Interim Report US Senate, Committee on Agriculture & For., Comm Print, Committee Print, 18 pp, Apr. 1974

**PERFORMING AGENCY:** Kansas State University, USDA National Economic Analysis Division

**INVESTIGATOR:** Schnake, LD

**SPONSORING AGENCY:** Economic Research Service, Department of Agriculture, NEA-14-126-20-01

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** July 1974

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0041789)

**20 099644**

**APPRAISAL OF THE CAPABILITY OF THE TRANSPORTATION SYSTEM TO MEET NEEDS OF AGRICULTURE AND RURAL AREAS**

Appraise the effectiveness of the rural transportation system to meet incurred demand for services and the capacity of the transportation system to economically move inputs under a policy of full production. Quantify effects of sharply increased exports on farm product storage and transportation facilities and identify long-run structural problems affecting the capability of the transportation system to serve rural areas.

Utilize secondary data sources and interview local, state and Federal officials to obtain an assessment of the capability of the transportation system to meet agriculture's need. Models and other appropriate analytical tools are basic to making systematic appraisal of the data upon which to draw conclusions. An interim report was submitted to the congress showing that extraordinary demands for grain and soybean transportation in 1973 were met. The hardships and costs of meeting the demands were discussed. Some of the long-run structural problems of the transportation industry were identified and data availability for analysis of the problems assessed. Held a workshop on rural transportation problems and assisted in planning and conducting four Extension Workshops concerning the activities generated by the Regional Rail Reorganization Act of 1973.

**REFERENCES:**

Transportation in Rural America; An Interim Report US Senate, Committee on Agriculture and For., Committee Print, 18 pp, Apr. 1974

**PERFORMING AGENCY:** Economic Research Service, Department of Transportation Economics

**INVESTIGATOR:** Reinsel, EI

**SPONSORING AGENCY:** Department of Agriculture, NEA-14-126-11-00

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** July 1974

**ACKNOWLEDGMENT:** Smithsonian Science Information Exchange (G4 41661)

**20 099645**

**EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE**

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economies of size and other factors about for-hire livestock truckers and trucking.

Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research.

Short-run needs for transportation services by the grain and soybean industries in FY 1974 were estimated; the supply of services likely to be available was found to be adequate to meet needs. Surveys were conducted of livestock shippers, feed and fertilizer distributors to determine their transportation practices. Limited surveys of livestock truckers were conducted to determine size and time in business. Potential loss of rail service in the Midwest-Northeast in zones where agriculture, forestry and rural development activities are important were estimated to occur for less than 10 percent of the carloads of traffic originated and terminated in the selected zones. Surveys now underway to obtain information about the nature and severity of economic effects from the potential loss of service. The food transportation bill for 1973 was estimated to be \$6.1 billion, no change from 1972. Transportation rates were higher in 1973 than in 1972, a decline in the quantity of U.S. produced foods consumed by the domestic civilian population offset the rate increases. Conducted analyses on various transportation rate and service actions and proposals to assist policy makers in understanding and evaluating the effects of changes on agriculture and rural areas.

**REFERENCES:**

Grain and Soybean Transportation Problems in Fiscal 1974 Umberger, DE; Hutchinson, TQ, Economic Research Service, Marketing and Transportation Sit., MTS-191, pp 22-28, Nov. 1973

The Price of Agricultural Transportation Gerald, JO, Grain Transportation Forum, Bismarck, North Dakota, Mar. 1974

Nature and Quality of Livestock Transportation Services Used by Shippers, Hoffman, LA, Transportation Committee of American Nat'l Cuttleman's Ass, Jan. 1974

Changing Technology in Grain Transportation Hutchinson, TQ, International Conr Quality Conference, Champaign, Illinois, Oct. 1973

Problems in Transporting Fiscal 1974 Grain and Soybean Exports, Umberger, DE; Hutchinson, TQ, Economic Research Service, For. Agri. Trade of U.S., pp 18-24

**PERFORMING AGENCY:** Washington State University

**INVESTIGATOR:** Casavant, KL

**SPONSORING AGENCY:** Department of Agriculture, NEA-14-125-53-01-X2

Contract 12-17-04-8-917-X

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** July 1974 **COMPLETION DATE:** July 1979

**ACKNOWLEDGMENT:** Smithsonian Science Information Exchange (G4 41788 46 286117)

**20 099646**

**EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE**

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run

needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economics of size and other factors about for-hire livestock truckers and trucking.

Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research.

Short-run needs for transportation services by the grain and soybean industries in FY 1974 were estimated, the supply of services likely to be available was found to be adequate to meet needs. Surveys were conducted of livestock shippers, feed and fertilizer distributors to determine their transportation practices. Limited surveys of livestock truckers were conducted to determine size and time in business. Potential loss of rail service in the Midwest-Northeast in zones where agriculture, forestry and rural development activities are important were estimated to occur for less than 10 percent of the carloads of traffic originated and terminated in the selected zones. Surveys now underway to obtain information about the nature and severity of economic effects from the potential loss of service. The food transportation bill for 1973 was estimated to be \$6.1 billion, no change from 1972. Transportation rates were higher in 1973 than in 1972, a decline in the quantity of U.S. produced foods consumed by the domestic civilian population offset the rate increases. Conducted analyses on various transportation rate and service actions and proposals to assist policy makers in understanding and evaluating the effects of changes on agriculture and rural areas.

#### REFERENCES:

Grain and Soybean Transportation Problems in Fiscal 1974 Umberger, DE; Hutchinson, TQ, Economic Research Service, Marketing & Transportation Sit., MTS-191, pp 22-28, Nov. 1973

The Price of Agricultural Transportation Gerald, JO, Grain Transportation Forum, Bismarck, North Dakota, Mar. 1974

Nature and Quality of Livestock Transportation Services Used by Shippers, Hoffman, LA, Transportation Comm of Amer Nat'l Cattleman's Ass, San Diego, Jan. 1974

Changing Technology in Grain Transportation Hutchinson, TQ, International Com Quality Conference, Champaign, Ill, Oct. 1973

Problems in Transporting Fiscal 1974 Grain and Soybean Exports, Umberger, DE; Hutchinson, TQ, Economic Research Service, For Agri. Trade of U.S.

PERFORMING AGENCY: Economic Research Service, Department of Transportation Economics

INVESTIGATOR: Gerald, JO Hutchinson, TQ

SPONSORING AGENCY: Department of Agriculture, NEA-14-125-11-00

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (G4 41660)

#### 20 099647

##### EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economics of size and other factors about for-hire livestock truckers and trucking.

Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research.

Short-run needs for transportation services by the grain and soybean industries in FY 1974 were estimated; the supply of services likely to be available was found to be adequate to meet needs. Surveys were conducted of livestock shippers, feed and fertilizer distributors to determine their transportation practices. Limited surveys of livestock truckers were conducted to determine size and time in business. Potential loss of rail service

in the Midwest-Northeast in zones where agriculture, forestry and rural development activities are important were estimated to occur for less than 10 percent of the carloads of traffic originated and terminated in the selected zones. Surveys now underway to obtain information about the nature and severity of economic effects from the potential loss of service. The food transportation bill for 1973 was estimated to be \$6.1 billion, no change from 1972. Transportation rates were higher in 1973 than in 1972, a decline in the quantity of U.S. produced foods consumed by the domestic civilian population offset the rate increases. Conducted analyses on various transportation rate and service actions and proposals to assist policy makers in understanding and evaluating the effects of changes on agriculture and rural areas.

#### REFERENCES:

Grain and Soybean Transportation Problems in Fiscal 1974 Umberger, DE; Hutchinson, TQ, Economic Research Service, Marketing & Trans Sit., MTS-191, pp 22-28, Nov. 1973

The Price of Agricultural Transportation Gerald, JO, Grain Transportation Forum, Bismarck, North Dakota, Mar. 1974

Nature and Quality of Livestock Transportation Services Used by Shippers, Hoffman, LA, Transportation Com Amer Nat'l Cattleman's Ass, San Diego, Jan. 1974

Changing Technology in Grain Transportation Hutchinson, TQ, International Corn Quality Conference, Champaign, Ill.

Problems in Transporting Fiscal 1974 Grain and Soybean Exports, Umberger, DE; Hutchinson, TQ, Economic Research Service, For. Agri. Trade of U.S.

PERFORMING AGENCY: Illinois University, Urbana, USDA, National Economic Analysis Division

INVESTIGATOR: Bunker, AR

SPONSORING AGENCY: Economic Research Service, Department of Agriculture, NEA-14-125-17-01

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information System (GY 41787), Smithsonian Science Information Exchange (CRIS 0041787)

#### 20 100248

##### A SIMULATION MODEL FOR ESTIMATING THE EFFECTS OF RATIONALIZING THE GRAIN COLLECTION, HANDLING AND DISTRIBUTION SYSTEM UPON THE PRAIRIE ECONOMY

The objective is to develop a framework in which rationalization of the grain transportation system in western Canada can be analyzed with respect to rural community effects. The system's approach will be employed at a regional level to assess the impact of railway branch-line abandonment and elevator closure upon the economy of prairie communities affected. Simulation and evaluation of some rationalization proposals in a specified bounded production region will occur to estimate the change in direct employment income to the region with total effect to be estimated by deriving a local multiplier. Tax revenue changes and changes in local infrastructure investment and maintenance--chiefly roads--will also be estimated. /RTAC/

PERFORMING AGENCY: Manitoba University, Canada

INVESTIGATOR: Magarrell, HK

SPONSORING AGENCY: Ministry of Transport, Canada, Transportation Development Agency

STATUS: Active NOTICE DATE: July 1976 START DATE: Sept. 1973

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

#### 20 128022

##### DOCK STRIKES AND EXPORT LOSSES IN THE INTERNATIONAL GRAIN TRADE

The study will be limited to international trade in grain (wheat, barley, oil-seeds). Also, estimates of the financial impact of such strikes on the economy will be limited to Canada and the United States (North American Exporters). In line with the above-mentioned objectives, this study is an attempt to develop a model which will allow accurate estimation of the impact of future strikes of various duration and location. Such estimates will be in terms of losses to the struck economy and gains to its neighbor and additional gains to its chief competitors in the market. An important practical advantage of this analysis would be that by application of the



model to estimate results of potential strikes in advance of their occurrence, public and private officials would be able to formulate appropriate marketing and transportation policies to cushion the estimated adverse impacts of such strikes. Further work on the project will focus attention on such questions as: (1) What is the critical duration for a strike during which serious shifts in the Canadian grain export markets may be expected to occur? (2) What factors influence the duration of the strike? (3) How can these shifts be measured?, and (4) What are the policy implications of these critical durations for the government and grain handling firms. /RTAC/

PERFORMING AGENCY: Manitoba University, Canada, Center for Transportation Studies  
 INVESTIGATOR: Tangri, OP  
 SPONSORING AGENCY: Ministry of Transport, Canada, Transportation Development Agency

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1973 COMPLETION DATE: 1977

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

**20 129707**  
**TECHNOLOGICAL FORECASTS, 1975-2000, A DESCRIPTIVE OUTLOOK AND METHOD FOR QUANTITATIVE PREDICTION**  
 A description of expected trends in transportation for both passenger and freight movements for the next 30 years. A methodology is also described for forecasting, at an aggregate level of detail and as a function of time value, out of pocket costs and trip distance, the modal split of passengers in a forecast year between 1975-2000.  
 Available from NTIS, AD-754178.

INVESTIGATOR: Golding, EI Velona, WD Poole, B  
 SPONSORING AGENCY: Office of Policy, Plans and International Affairs  
 RESPONSIBLE INDIVIDUAL: Velona, WD

STATUS: Active NOTICE DATE: Feb. 1977

ACKNOWLEDGMENT: FRA

**20 129726**  
**ANALYSIS OF ALTERNATIVES AVAILABLE TO THE ALASKA RAILROAD FOR COMPLEMENTING THE PRESENT AND FUTURE ALASKA TRANSPORTATION**  
 Assess the effect of the present transportation environment on the Alaska Railroad and make recommendations with respect to the most practicable future role of that railroad through the year 2000.

PERFORMING AGENCY: Consad Research Corporation  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development  
 RESPONSIBLE INDIVIDUAL: Anderson, EW (Tel 202-426-0771)

Contract DOT-FR-43010  
 STATUS: Active NOTICE DATE: July 1976 START DATE: 1974 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$65,000

ACKNOWLEDGMENT: FRA

**20 129727**  
**DOMESTIC AND INTERNATIONAL TRANSPORTATION OF U.S. FOREIGN TRADE: 1976-GENERAL CARGO COMMODITIES (PHASE II)**  
 Objective is to obtain, (a) New data on the domestic origins and destinations, and the characteristics of domestic transportation, for commodities being transported via international air and vessel movements in U.S. foreign trade, and (b) New data on the transshipment of this type of commodity by truck and rail between U.S. and Canada (or Mexico) for trade with other foreign countries. Data will be collected by a sample survey (50,000 observations) and merged with existing data on international trade.

Co-sponsors are St. Lawrence Seaway Development Corp., U.S. Dot; U.S. Army Corps of Engineers, Institute for water Resources, Ft. Belvoir, Virginia; Maritime Admin, Dept of Commerce.

**REFERENCES:**

Domestic & Intl Transportation of U.S. Foreign Trade: 1975- Gen Cargo Commodity; Phase I: Prelim Studies, Spec & Plans, Bureau of the Census

PERFORMING AGENCY: Bureau of the Census, Economic Surveys Division, 63-7108

INVESTIGATOR: Wright, DG (Tel 202-763-7330) Decker, Z  
 SPONSORING AGENCY: Office of Policy, Plans and International Affairs; Office of Transportation Syst Anal and Information, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Murphy, RD (Tel 202-426-2090)

Contract DOTAS050059  
 STATUS: Active NOTICE DATE: Feb. 1976 START DATE: Oct. 1975 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$600,000

ACKNOWLEDGMENT: Office of Policy, Plans and International Affairs

**20 129728**  
**CTS DATA BASE STANDARDIZATION STUDY**  
 Development of a commodity flow data base utilizing the 1963, 1967 and 1972 Commodity Transportation Surveys (CTS) specifically designed to facilitate retrieval of directly comparable, detailed data for those three census years. In terms of immediate research needs, an update of the modal split will be prepared.

PERFORMING AGENCY: Transportation Systems Center  
 INVESTIGATOR: Jordan, L  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development; Federal Highway Administration; Office of the Secretary of Transportation  
 RESPONSIBLE INDIVIDUAL: Bourque, WL (Tel 202-426-0771)

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$30,000

ACKNOWLEDGMENT: FRA

**20 136085**  
**STUDY OF RADIOACTIVE MATERIAL TRANSPORT PROBLEMS 1976-2000**  
 The aim of the project is to examine future transportation systems, trends, and problems associated with transport of radioactive and fuel cycle materials to assure a more orderly problem solving approach. Work areas include: (1) characterize the current transportation systems; (2) project future transportation needs and systems; (3) identify and analyze potential future transportation problems; (4) suggest actions to minimize impact of potential problems.

PERFORMING AGENCY: Battelle Memorial Institute/Pacific Northwest Labs, RL 6617B  
 INVESTIGATOR: Loscutoff, WV (Tel (509) 946-2768) Hall, JH  
 SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division  
 RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract ERDA-AT-(45-1)-1830  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$275,000

ACKNOWLEDGMENT: Energy Research and Development Administration

**20 138123**  
**IMPACT OF CHANGING TRANSPORTATION SYSTEMS ON GRAIN AND FARM SUPPLY MARKETING FIRMS**  
**OBJECTIVE:** Estimate the quantities of grain that will move through South Dakota country elevators and commercial channels in 1980. Estimate the South Dakota demand for feed grains, processed feed and fertilizer in 1980. Project alternate changes in grain transportation for South Dakota. Determine the economic feasibility of alternative modes of grain movement from producers to shipment destinations. **APPROACH:** Develop estimates by crop reporting district of the quantities of grain and livestock produced and grain marketed to 1975 and 1980. Formulate similar estimates of the demand for feed and fertilizer to 1975 and 1980. Project changes on grain transportation including railroad abandonment and equipment availability. Determine transportation rates of various modes of transportation available to shippers in the crop reporting districts. Develop cost estimates of alternative systems of grain transportation.

PERFORMING AGENCY: South Dakota State University, Agricultural Experiment Station, Dept of Economics  
 INVESTIGATOR: Payne, WF  
 SPONSORING AGENCY: Department of Agriculture, South Dakota Cooper-

ative State Research Service, 0065580 SD00694  
STATUS: Active NOTICE DATE: Feb. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 65580 1)

#### 20 138364

##### EVALUATION OF ALTERNATIVE TRANSPORTATION SYSTEMS AND POLICIES FOR RURAL MISSOURI

Estimate transport requirements to 1985 and 1990. Estimate economic effects of alternative rural transport systems. Assess state and federal roles in setting transport policy and planning and regulating transport systems. Study economic effects of alternate plans and policies on carriers, shippers and rural areas. Present Missouri rural transport system will be described. Demand for services will be measured and projected to 1985 and 1990. Expected changes in the system will be identified. Cost and service levels will be compared under simulated modal combinations and regulatory patterns. Merits of alternative systems and policies will be evaluated. A survey of grain transportation methods, costs and volume of movement has been completed in a 16 county area of Northwest Missouri. Input data is being evaluated in a location--transshipment model as a basis for cost-reducing and energy-conserving decisions in the handling and marketing of grain. Preliminary findings indicate the possibility of significant cost-savings through adjustment of assembly and storage patterns to permit long-haul transport in larger volume shipments at lower unit cost. Field work has been completed on an inventory of transportation services available to shippers in rural Missouri. In addition to providing a basic description and evaluation of the transport infrastructures and services, the study identifies stress points or impediments within the system, such as inadequate intermodal coordination and problems of equipment supply and allocation. Data has been made available to state agencies for use in transportation policy and systems planning. Results will also be reported for use in private sector decision making. State-wide studies are in the planning stage, making broader application of the methodology and input data developed. These studies will be coordinated to provide the information base needed by state agencies and by transportation and shipper firms for transportation policy and planning decisions.

##### REFERENCES:

Missouri Rural Transportation in Jeopardy Moser, DE, Missouri University, Extension Division, Vol. 18; No. 8, Aug. 1975

PERFORMING AGENCY: Missouri University, Columbia, Department of Agricultural Economics, MO00040

INVESTIGATOR: Moser, D

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1980

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0068730)

#### 20 138365

##### TRANSPORTATION MODEL OF THE GRAIN AND FERTILIZER SECTOR OF NORTHWEST OHIO

Describe the present condition of the rural transportation system in selected areas of Ohio. Estimate probably grain and fertilizer, in selected areas of Ohio. Estimate the optimal flow of commodities between production and consumption points through the network. Trace the effects of alternative government transportation policies on the operation of the transportation system. Conduct cost-benefit analyses of alternative investments in the rural transportation system. Develop a transportation model to evaluate the impact of changes in the transportation system and government policy on the movement of agricultural commodities and future needs of the transport industry. The research to date on this project has focused on identifying the branch rail lines which will be abandoned in the study area and the number and size of grain and fertilizer firms located on the branch lines. The rail abandonment problem has been conceptualized as a transshipment problem in a transportation network of links and nodes with specified capacity constraints. Data collection will begin in the near future.

##### REFERENCES:

Rail Transportation Problems in Ohio Larson, DW, Ohio State University, Dept Agri Econ and Rural Soc, No. 577

The World Food Crisis: Implications for Trade and Aid Larson, DW, Ohio State University, Dept Agri Econ and Rural Soc

PERFORMING AGENCY: Ohio State University, Agricultural Economics and Rural Sociology, OHO00534

INVESTIGATOR: Larson, D

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0067954)

#### 20 138367

##### NATIONAL TIMBER AND WOOD PRODUCTS REQUIREMENTS

Analyze the present and prospective consumption of timber and wood products in the national economy by components and relate these requirements to the national to the national timber supply situation. Develop and apply sampling systems to measure quantities consumed in construction, manufacturing, shipping, and other major end uses. Develop and apply accurate models which monitor shifts in wood raw materials use. Develop and apply techniques for converting wood product consumption estimates into estimates of timber supply requirements.

PERFORMING AGENCY: Forest Products Laboratory, FPL-4202

INVESTIGATOR: Stone, RN

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 COMPLETION DATE: Apr. 1980

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0042894)

#### 20 138370

##### EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economies of size and other factors about for-hire livestock truckers and trucking. Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research. A survey of livestock truckers was conducted to determine their tenure, growth, economies of size, rate-cost relationships, and other facts about their competitiveness and efficiency. Analysis of the survey is underway. Surveys of local Federal government employees to determine users of rail services at 100 rural stations in the Midwest-Northeast regions and of users located at 16 Midwest agricultural stations were conducted. Agribusiness firms subject to loss of rail service were found likely to suffer either direct financial loss or reduction of growth potential. Loss of rail service was not expected to have serious impacts on current rural development. An analysis of the impacts of higher fuel prices on the mobility of rural people found a relatively larger cost increase to rural than to urban people. The increased annual cost to the average urban household of a 25 cent per gallon price rise was \$175; and to the average rural household, \$250. An analysis of actual versus perceived variability of transit time found little difference in variability.

##### REFERENCES:

Effects of the Proposed Northeast-Midwest Rail Reorganization on Rural Areas, U.S. Senate, Agriculture and Forestry Comm, Mar. 1975

PERFORMING AGENCY: Kansas State University, Transportation Economics Division, NEA-14-125-53-01-X1

INVESTIGATOR: Casavant, KL

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: Jan. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0041974)

20 138376

**IMPACT OF CHANGES IN WORLD FOOD SUPPLY-DEMAND UPON SELECTED AGRICULTURAL MARKETS**

Estimate input usage to achieve the projected agricultural production, considering probable price and availability of farm inputs. Determine the adaptability of the existing agricultural input market organization to meet projected changes in agricultural output (and to suggest alternative organization in case input market structure is found to be inadequate). Input usage ranges will be estimated based on technical coefficients from secondary sources: input studies, farm management budgets and LP analyses. Consideration will be given to likely changes in resources mixes. Budgeting or linear programming procedures will be used to determine expected future resource utilization rates. Production projections from secondary sources will be used in estimating total input requirements. A multiple-product (LP) cost evaluation model will be used to measure the effect of price changes on farm input retailing costs. Sensitivity analysis applied to cost coefficients will facilitate the measurements. The effects of factor and product price changes on scale, volume and product diversity economies will be measured by rerunning the LP model using alternative price assumptions. Results of the LP runs will be used to compare optimum-cost structural conditions with actual assess operational efficiency.

PERFORMING AGENCY: Nebraska University, Lincoln, Department of Agricultural Economics, NEB-10-060  
 INVESTIGATOR: Anderson, DG Lytle, PW  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1971 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0060266)

20 138381

**PREDICTED EFFECTS OF SELECTED POLICY AND TECHNOLOGY CHANGES ON THE GRAIN MARKETING SYSTEM**

Evaluation the effects of alternative government policies and technological changes on the market structure in the grain industry. Illinois' contribution to SM-42 will focus on the identification of marketing facilities and flow of grain using secondary sources of data as well as sample survey techniques. Due to availability of data on daily prices of grain at 30 points across the state from the Illinois Market News Service, the explanation of spatial and temporal price differentials in Illinois will serve as a pilot study for the rest of the region. Spatial equilibrium models will be used to determine the least cost structure for the marketing system based on the recorded pattern of flows and prices. Micro and macro optima will be investigated to provide guidance in the adjustment toward the least cost organization of the industry. Analysis of grain flow by origin, destination, and mode of transport is continuing. The data have been used in several public information types of articles and in development of position statements on the effect of changes in water and rail rates. The data indicate that the Illinois River provides over 10 percent of all transportation of Illinois soybeans and the bordering counties are therefore the major source of soybeans moving to the Gulf Ports. Changes in the pattern of movement due to the expansion of unit train rates will be evaluated from comparison of the 1970 data with a supplemental survey of the same sample of elevators interviewed in 1974.

PERFORMING AGENCY: Illinois University, Urbana, Department of Agricultural Economics, ILL-05-0374  
 INVESTIGATOR: Hill, LD Scott, JT Brooks, BL  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1970

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0006106)

20 138437

**APPRAISAL OF THE CAPABILITY OF THE TRANSPORTATION SYSTEM TO MEET NEEDS OF AGRICULTURE AND RURAL AREA**

Appraise the effectiveness of the rural transportation system to meet incurred demand for services and the capacity of the transportation system to economically move inputs under a policy of full production. Quantify effects of sharply increased exports on farm product storage and transportation facilities and identify long-run structural problems affecting the capability of the transportation system to serve rural areas. Utilize secondary data sources and interview local, state and Federal officials to obtain an assessment of the capability of the transportation system to meet agriculture's need. Models and other appropriate analytical tools are basic to making systematic appraisal of the data upon which to draw conclusions. An interim report was submitted to the Congress showing that extraordinary demands for grain and soybean transportation in 1973 were met. The hardships and costs of meeting the demands were discussed. Some of the long-run structural problems of the transportation industry were identified and data availability for analysis of the problems assessed. Held a workshop on rural transportation problems and assisted in planning and conducting for Extension Workshops concerning the activities generated by the Regional Rail Reorganization Act of 1973.

REFERENCES:

Transportation in Rural America: An Interim Report Committee on Agriculture and Forestry, US Senate, 18 pp, Apr. 1975

PERFORMING AGENCY: Economic Research Service, Department of Transportation Economics, ERS NEA  
 INVESTIGATOR: Hart, RK  
 SPONSORING AGENCY: Department of Agriculture, NEA-14-126-11-00-X1

ID 12-17-04-5-1030

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0041972)

20 147743

**A PLANNING GRANT TO DEVELOP A RESEARCH PROJECT IN COAL-ENERGY ALTERNATIVES FOR THE STATE OF WYOMING**

The objective of this proposal is to develop an analytical system that can be used to identify and describe coal-energy development alternatives for Wyoming's Power River Basin; in turn, the development alternatives will be used to determine different energy transport options. As previously stated, there is an interdependent relationship between transportation and development alternatives and between these two sets of alternatives and socioeconomic and environmental objectives. Albeit, there has to be a starting place in the research endeavor and the research task has to have a definitive scope. In this regard, the analytical core of this proposal is limited to the development of a system to be used in identifying development alternatives and determining transportation options. Socioeconomics and environmental considerations will be treated as secondary impacts.

PERFORMING AGENCY: Wyoming University, School of Arts and Sciences; State Government, Wyoming  
 INVESTIGATOR: Meyer, EG Freudenthal, DW  
 SPONSORING AGENCY: National Science Foundation, Div. of Policy Res. & Analysis, PRA75-20974

STATUS: Active NOTICE DATE: Sept. 1976 START DATE: June 1976 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$33,510

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (CE 129)

20 148327

**ANALYSIS OF FREIGHT MARKETS**

A major capability needed for national transportation planning is an ability to determine the way in which shippers will respond to changes in freight service. During the first year of the contract, the research objective was the extension of an existing set of computer techniques for determining freight modal choice and shipment size. Using origin-destination data from the Commodity Transportation Survey, the techniques attempted to give the planner the ability to simulate shipper's behavior. This approach involves a procedure for determining the optimal inventory, control, and shipment strategy of a shipper who is assumed to be fiscally responsible for the maintenance of each of a series of commodities. The program minimized the total logistics cost of ordering, transportation, storing, capital carrying, and

## Freight Transport Demand Analysis

possible stockout. During the second year of the contract, the research will focus on the supply side and examine the carrier rather than the shipper or receiver. Within this framework, the overall goals of the carrier will be analyzed. Choice variables for vehicle type, scheduling and routing will be identified. From analysis of these attributes, cost and performance functions will be developed. The overall methodology, including the demand models developed in the previous years will be tested in an example problem, and a final report will be delivered. Computer models, simulating the decision making processes of individual shipping firms pertaining to mode choice, shipment size, and shipping frequency, have been developed. In addition, the research team has gathered data on routine shipments of more than 500 commodities for a major food chain. From this data base, presently fully computerized, three freight markets have been selected for further analysis. Data for these three markets has been used to three freight markets have been selected for further analysis. Data for these three markets has been used

to calibrate the demand side modelling techniques.

### REFERENCES:

Factors Influencing the Demand for Goods Movements Roberts, PO,  
CTS Rept. #75-16, 34 pp, Sept. 1975

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Roberts, PO

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Harman, J

Contract DOT-OS-50112

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$168,832

ACKNOWLEDGMENT: DOT

**21 045142**

**INSTALLATION OF A RAIL TERMINAL MANAGEMENT SYSTEM (RTMS)**

Rail Terminal Management System is a developmental system. This represents the first full-yard RTMS implementation and encompasses the use of automatic car identification scanners, wheel directional sensors, mini-computers and other related equipment at Deramus Yard, Shreveport, Louisiana and will permit a real-time inventory of the terminal to be maintained. As cars enter the yard a switch list preparation is automatically initiated and when trains are dispatched, an accurate consist list is immediately available. The Rail Terminal Management System is expected to be beneficial, both to the railroad in the form of increased efficiency and to the general shipping public in reduced delays and improved service.

PERFORMING AGENCY: Kansas City Southern Railway; Louisiana and Arkansas Railway

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr

Contract DOT-FR-30047

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1973 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$400,000

ACKNOWLEDGMENT: FRA

**21 058027**

**CHICAGO RAILROAD TERMINAL INFORMATION PROJECT (CRTIS)**

Collect data and study elapsed yard times, car cycles and other factors which can increase car utilization and speed car movements within the Chicago terminal area.

PERFORMING AGENCY: Chicago Railroad Terminal Information System, Inc.

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Braddock, C (Tel 426-2920)

Contract FR-20071

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: June 1972 COMPLETION DATE: June 1975 TOTAL FUNDS: \$2,317,549

ACKNOWLEDGMENT: TRAIS

**21 058252**

**ANALYSIS OF CLASSIFICATION YARD TECHNOLOGY**

This study comprises a survey and assessment of the state-of-the-art in rail freight car classification yard technology. Separate tasks include establishment of a detailed description of the hardware, costs, performance characteristics, and operational practices of existing yards; formulation of general yard-network interaction concepts; collection of detailed background information concerning the yard population in the United States, categorized by type, technology, and function; estimation of the demands likely to be placed upon the nation's network of freight car terminals during the foreseeable future, and an assessment and prioritization of those areas of terminal operations which warrant further technological research or development.

PERFORMING AGENCY: Stanford Research Institute

INVESTIGATOR: Petracek, S (Tel 415-326-6200)

SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Hopkins, JB (Tel 617-4942048)

Contract DOT-TSC-968

STATUS: Active NOTICE DATE: July 1976 START DATE: Jan. 1975 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$127,781

ACKNOWLEDGMENT: FRA

**21 058279**

**SYSTEMS ENGINEERING FOR INTERMODAL SYSTEMS**

The objective of the systems engineering effort in connection with intermodal systems is to define and analyze the great number of variables that affect the design, layout and equipment for use in a rail-highway intermodal system. The areas to be investigated include the functions required of gateway and intermediate terminals (light density as well as heavy density

service in each type of terminal), the equipment needed to operate an efficient system such as rolling stock, handling equipment and propulsion and the control processes necessary to optimize utilization of plant.

The contract to a performing organization has not yet been awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Blachfield, JR (Tel (202)426-0808)

STATUS: Active NOTICE DATE: July 1976 START DATE: Feb. 1977 COMPLETION DATE: Feb. 1979

ACKNOWLEDGMENT: FRA

**21 058461**

**INVESTIGATION OF THE AERODYNAMIC DRAG OF CONTAINERS AND TRAILERS ON FLATCARS**

Wind tunnel tests have been conducted on one fortieth scale models of trailers on flatcars (TOFC) and containers on flatcars (COFC). Various configuration changes to reduce aerodynamic drag were explored. Experiments on very simplified models were also conducted to obtain a fundamental understanding of the phenomena involved.

PERFORMING AGENCY: Hammitt (Andrew G) Associates

INVESTIGATOR: Hammitt, AG (Tel 213-541-1328)

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, 612-0278-AT

RESPONSIBLE INDIVIDUAL: Barrows, TM (Tel 617-494-2451)

Contract DOT-TSC-1002 (FFP)

STATUS: Active NOTICE DATE: July 1976 START DATE: Mar. 1975 COMPLETION DATE: 1976 TOTAL FUNDS: \$24,900

ACKNOWLEDGMENT: TRAIS (612-0278-AT)

**21 097348**

**ST. LOUIS TERMINAL PROJECT**

The railroad industry's Labor/Management Committee, which is comprised of the chief executives of railroads and labor organizations, established a number of labor/management programs to work on specific problems areas. The St. Louis Terminal Project is one such activity. A Task Force on Terminals was established by the Labor/Management Committee with the objective of increasing the reliability, speed and efficiency of car movements through a major existing railroad terminal so that the quality and saleability of rail transportation is improved, thereby attracting additional traffic and improving employment opportunities. The improvements are to be made without capital expenditures. This objective is being achieved through a series of experiments involving changes in operating practices, labor agreements, rates, and regulations. Missouri Pacific's St. Louis Terminal division was selected as the laboratory for this experimentation. A Project Team was formed to head up the project. The Project Director and Assoc. Director were recruited from the ranks of management and labor. The St. Louis Terminal Project consists of the following activities: 1) identification of potential changes, 2) implementation of experiments, and 3) method to measure the quantitative impacts of experiments, a computerized car movement evaluation system was developed. This system and the underlying approach can be used by any railroad. This project is unusual in the labor and management are working together to implement significant changes in railroad terminal operations which will hopefully lead to improved service, more and better jobs. The lessons learned from this project should have wide application throughout the industry.

See also RRIS 21A 129731.

PERFORMING AGENCY: Task Force on Rail Transp of the Labor/Mgt Comm

INVESTIGATOR: Dyer, VG (Tel (314) 622-2750) Zamarioni, FJ

SPONSORING AGENCY: Railroad Labor Organizations; Association of American Railroads; Federal Railroad Administration; Missouri Pacific Railroad

RESPONSIBLE INDIVIDUAL: Collins, DW (Tel (216) 228-9400 X-32)

Contract EB-400-0-ARR-849

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1973 TOTAL FUNDS: \$890,000

ACKNOWLEDGMENT: FRA

21 099387

**FREIGHT CAR MANAGEMENT PROGRAM**

This program presently involves four phases: (1) Systems Operations including service reliability studies, data interface standards and car cycle sampling; (2) Operating Practices as involved with Car Service rules, per diem rates and car distribution procedures; (3) Information Technology developing Car Assignment Model and Demand Forecast Model; (4) Operating Systems with the Line Operations phase involving Grand Trunk Western and Missouri Pacific and the Yard Operations phase involving the Kansas City Southern at Shreveport, La., and the Chicago Railroad Terminal Information System.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Systems Analysis and Program Development

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Braddock, C (Tel 202-4262920)

STATUS: Active NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

21 099397

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM--PHASE I**

Since an increase in car utilization would effectively increase the car supply, a research and action program directed at improving utilization has been undertaken. A significant improvement probably can be achieved without revolutionary changes on the part of shippers, railroads and government agencies. A quantitative assessment of the potential for improvement can be made when an adequate data base on car cycles is available. Analysis of these car cycles from load to load would reveal the fraction of time a car spends being loaded, being moved by railroads and being unloaded. Car utilization is expressed in terms of a wide variety of indices. None is wholly satisfactory for evaluation of all aspects of utilization and none in common use permits analysis of the economic effectiveness of use of the car fleet. A \$12 million program, extending through 1980, is projected. The first phase, a two-year program, includes: Analysis of current practices and problems; (2) Development of car utilization measurement standards; (3) Collection of data for a more complete car cycle analysis; (4) Recommendation of projects for FRA consideration; (5) Analysis of the impact of AAR and ICC rules, directives and orders on car utilization; (6) Study of freight car time reliability. Each of these projects is expected to identify specific opportunities for improvement in car utilization.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute; Federal Railroad Administration; Interstate Commerce Commission; Railroad Labor Organizations; Transportation Association of America

RESPONSIBLE INDIVIDUAL: Leilich, GM (Tel 202-293-5018)

STATUS: Active NOTICE DATE: July 1976 START DATE: 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$2,365,000

ACKNOWLEDGMENT: AAR

21 099403

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM. PHASE I. TASK 6--RELIABILITY STUDIES**

Design and conduct a series of experiments, coordinated with Task 3, which will permit statistically sound evaluations of alternatives to improve rail service reliability and the effects these alternatives have on equipment utilization.

For further information on related studies see also RRS 099398 Section 26A, 099399 17A, 099400 17A, 099401 17A, 099402 24A.

PERFORMING AGENCY: Association of American Railroads

INVESTIGATOR: Yarbrough, HF (Tel 404-688-0800)

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Leilich, GM (Tel 202-293-5018)

STATUS: Active NOTICE DATE: July 1976 START DATE: 1975 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: AAR

21 107295

**UTILIZATION AND IMPROVEMENT OF VEHICLES FOR TRANSPORT OF GRAIN**

The objectives are to improve the utilization of present transport equipment for grain and to develop new transport concepts, in order to hold down transport costs and reduce loss and damage to grain in transit. The approach will be to study present equipment, methods, and techniques for the transport and physical distribution of grain, evaluate each phase of distribution on the basis of cost and performance, and develop concepts for changes in equipment and methods with a view toward: better utilization of present equipment; development of improved transport equipment and techniques; faster loading and unloading of vehicles; reducing overall physical distribution time; reducing the number of times the product is handled and transferred; evaluating and testing new ideas. The Progress Report will include: Exploratory work was continued to determine if it might be feasible to increase the utilization of railroad boxcars through heavier loading of cars. Data were obtained on 2,000 box car loads of wheat and corn handled at Chicago, Minneapolis, and Kansas City. That data indicated that boxcars have an average load limit of about 65 tons, and that the average weight of grain loaded into the cars is about 60 tons. Although it would appear that cars could, on the average, be loaded with 5 more tons of grain, it was found not feasible to do so. There are four factors which, in combination, prevent heavier loading. They are: Variation in load limits of cars; variation in grain weight; grain door height (some open space above door must be allowed through which to insert the loading spout); and, some space must be allowed between the top of the load of grain and the car roof so that a man has room to maneuver to insert a grain probe.

PERFORMING AGENCY: Agricultural Research Service, Transportation Facilities Division, 1104-15841-006

INVESTIGATOR: Guilfooy, RF, Jr

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1972 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (CRIS 0022877)

21 129729

**RAILROAD YARD OPERATIONS COSTING METHODOLOGY**

To develop, test, and justify a set of methodologies and procedures to be used for estimating the cost of providing, maintaining, and operating Yards and Terminals and their application to pricing, control, investment and other management purposes.

PERFORMING AGENCY: Haskins and Sells; Seaboard Coast Line Railroad; Whitten (Herbert O) and Associates

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Lawler, JD (Tel 202-426-0771)

Contract DOT-FR-65135

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$482,299

ACKNOWLEDGMENT: FRA

21 129730

**RAILROAD LABOR STUDY-LINE HAUL**

Expand experiments at St. Louis terminal to other terminals and conduct line-haul experiments to improve car utilization, employee productivity and capital utilization.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development

RESPONSIBLE INDIVIDUAL: Collins, DM (Tel 202-426-0771)

Contract DOT-FR-43003

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$670,000

ACKNOWLEDGMENT: FRA

21 129731

**RAILROAD LABOR STUDY-TERMINALS**

To identify and test, on an experimental basis, certain changes in railroad terminal operations including changes in labor agreements, where necessary,

designed to improve employee productivity, capital utilization and shipper service. To design and utilize effective means of evaluating the effectiveness of said changes.

This is FRA funding toward St. Louis Terminal Project, RRIS 21A 097348.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development  
RESPONSIBLE INDIVIDUAL: Collins, DM (Tel (202) 426-2608)

Contract DOT-FR-4-3003  
STATUS: Active NOTICE DATE: July 1976 START DATE: 1974 TOTAL FUNDS: \$135,000

ACKNOWLEDGMENT: FRA

## 21 130499

### SOLID WASTE RAIL HAUL AND DISPOSAL SYSTEM

The City of Philadelphia has received an Environmental Protection Agency Grant to design and implement a demonstration rail haul and disposal system of 1,000 tons of refuse. The objective is to demonstrate that municipalities can effectively work together such that solid waste can be transported from a local transfer station to a sanitary landfill at least 100 miles from Philadelphia in an environmentally and economically acceptable manner utilizing a railroad carrier. Phase I of the grant is for a six (6) month period and involves the U.S. Environmental Protection Agency, the State of Pennsylvania Department of Environmental Resources and the City of Philadelphia in finding an environmentally sound strip mine landfill in Pennsylvania at least 100 miles from Philadelphia. During this period, the County in which this land is located would be aided in forming the necessary legal structure to enter into a contract with the City of Philadelphia for receipt of the material and operating the disposal facility. Phase II is for one (1) year and involves design and construction of the facilities to operate the system. The present approach to handling the refuse, is to load containers using the City's truck transfer stations, hauling the containers by tractor trailer to a railroad transfer site where the containers will be loaded on to flatcars. At the disposal site, the containers will be unloaded from the flatcar on to specially designed hauling vehicles. These vehicles will transport the containers to the active face of the landfill and unload them. The empty container will be returned to the rail site and loaded back on to flatcars. The empty train with the containers will be returned to Philadelphia. The total round trip for container through loading, hauling, unloading and return haul would be 3 days, requiring 3 trains in some stage of operation at all times. Phase III is for one (1) year and involves operation and evaluation of the system.

PERFORMING AGENCY: Philadelphia, City of, Pennsylvania, Department of Streets  
INVESTIGATOR: Smith, G  
SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AO 20448)

## 21 138372

### IMPROVING RAILROAD REFRIGERATED TRANSPORTATION OF FRESH MEATS

Improve the efficiency of transporting fresh meats from packinghouses to consignee using railroad refrigerated trailers. Studies designed to evaluate and improve the present handling procedures and equipment performance will be conducted to determine where significant improvements can be made in the distribution of fresh meat. Equipment cleaning and pretripping maintenance practices will be thoroughly reviewed to provide information where improvements in the present distribution systems need to be made, than a series of recommended procedures will be developed. Handling techniques will also be reviewed and improved. Suggestions for improvement will be applied to actual meat shipments and evaluated by a team of researchers and industry representatives. Cooperation with APHIS, Association of American Railroads, individual railroad companies, refrigeration equipment companies, and other Government Agencies will be encouraged. The practices and procedures followed by three railroads and three truck cleaning facilities for the preparation of refrigerated meat trailers prior to

loading with carcass or boxed meat were reviewed to obtain information on such items as water volume, water temperature, detergents and cleaning agents used, sanitation program followed, and cleaning of meat hooks. Since railroad piggyback meat trailers have a longer turn-around time between loading a packinghouses than do truck meat hauling trailers, they are more difficult to clean. A cleaning and sanitizing program for refrigerated meat trailers is being developed.

PERFORMING AGENCY: Department of Agriculture, Transportation and Packaging Research Laboratory, 1104-15841-011

INVESTIGATOR: Hoke, KE

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 COMPLETION DATE: Nov. 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0041945)

## 21 138525

### FREIGHT CAR UTILIZATION PROGRAM-PHASE I

As freight car utilization is a nationwide problem beyond ability of a single railroad to correct, there is a need for cooperative research program between the railroad industry and the Federal Government. This program is addressing six critical research and demonstration needs: analysis of current practices and problems; development of car utilization definitions and measurement standards; car cycle analysis; freight car control projects; impact of AAR and ICC rules, directive; and reliability studies. These studies will define more precisely the problems that are being confronted by the railroads, shippers and FRA in attempting to improve car utilization.

See also 21A 099397.

#### REFERENCES:

Manual of Car Utilization Practices and Procedures Final Draft, June 1976

PERFORMING AGENCY: Association of American Railroads

INVESTIGATOR: Leilich, GM (Tel (202)293-5018)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)

Contract DPT-FR-65146

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: May 1977

ACKNOWLEDGMENT: FRA

## 21 138527

### CHICAGO TERMINAL PROJECT

To increase the reliability, speed and efficiency of car movements through a major existing railroad terminal so that the quality and saleability of rail transportation is improved, thereby attracting additional traffic improving employment opportunities. The improvements are to be made without capital expenditures. This objective is being achieved through a series of experiments involving changes in operating practices, labor agreements, rates, and regulations.

Co-sponsors include Railroad Labor Organizations, Association of American Railroads and Chicago Railroad Terminal Information System.

PERFORMING AGENCY: Task Force on Rail Transportation, Missouri Pacific Railroad, Proj No. 5178

INVESTIGATOR: Adamson, E

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Collins, DW (Tel (202)426-2608)

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$682,050

ACKNOWLEDGMENT: FRA

## 21 148356

### IMPROVED CONTROL TECHNIQUES TO REDUCE IMPACT DAMAGE IN MARSHALLING YARDS

To seek improvements in control of the rolling cuts in marshalling yards which will: (1) reduce the costs associated with impact damage to both freight and cars, including such costs as may arise through dangerous situations from over speed impacts, (2) permit higher, and more continuous,



flows of traffic through existing yards, a Monte Carlo approach, based on a model using 9 tracks, entry curve effects, master and secondary retarders, train arrival and departure patterns. The operation of the yard is simulated in full detail, including events such as over speed impacts, stalling, overtakings, over a continuous period of operation. The effects of alternate retarder release-speed policies, and grading of the yard, on the operation are being investigated.

## REFERENCES:

Improvement of Automatic Coupling-up Performance in Marshalling Yards, Kerr, CN, CIGGT, No. 75-15, Jan. 1975

Design of Yard Control Equipment for Perfect Car Handling, Mattison, JT, ASME, Paper 68-WA/RR-6

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport

INVESTIGATOR: Kerr, CN

SPONSORING AGENCY: Canadian National Railways

STATUS: Active NOTICE DATE: Feb. 1977 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

21 148807

## IOWA RAIL YARD AND TERMINAL STUDY

The objective of this research is to investigate the functioning of rail terminal facilities in Des Moines and Marshalltown, Iowa, and to recommend changes in physical layout or operating procedures that will enhance the efficiency of terminal services at these locations. Actual car holding times are analyzed for comparison with theoretical minima based on scheduled train arrival and departure times, switch crew assignments, power availability, and other factors.

PERFORMING AGENCY: Iowa State University, Ames, Engineering Research Institute

INVESTIGATOR: Carstens, RL (Tel (515) 294-6777) Kannel, EJ

SPONSORING AGENCY: Iowa State University, Ames, Engineering Research Institute

RESPONSIBLE INDIVIDUAL: Peterson, PW (Tel (515) 294-2336)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$1,500

ACKNOWLEDGMENT: Iowa State University, Ames

22 052066

**FREEZING PROBLEMS DURING RAIL TRANSPORTATION**

Field survey to obtain information regarding experimental and analytical studies, field trials, product or equipment evaluation, description of type and severity of freezing problems, current practices and their effectiveness, operating cost estimates and current energy utilization.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, Queen's University

INVESTIGATOR: Colijn, H

SPONSORING AGENCY: Canadian National Railways; Ministry of Transport, Canada; Queen's University, Canada

STATUS: Completed NOTICE DATE: Feb. 1977 COMPLETION DATE: Feb. 1977

ACKNOWLEDGMENT: CIGGT

22 058834

**A PILOT STUDY TO INVESTIGATE EFFICIENT COMPLEMENTARY TRANSPORTATION AND MARKETING SYSTEMS FOR SOUTH DAKOTA**

This effort will: 1. Conduct an integrated study of the current structure and organization of transportation and marketing systems for the three or four major commodity flows in the South Dakota and the Western Plains/Rocky Mountain Region. 2. Investigate alternative distribution systems designed to maximize the net returns from South Dakota's two or three major outbound commodity shipments and to minimize the net costs of the major inbound commodities to South Dakota. 3. Develop recommendations on measures appropriate for implementation of efficient, socially desirable distribution alternatives for South Dakota's major commodity flows. STATUS: Initial efforts were directed toward understanding the economic structure of grain, lumber and mineral transportation and handling in South Dakota. Transportation supply and demand frameworks were constructed for each commodity. For the grain industry, both assembly and handling costs were also investigated. The analysis model used in this study is a linear programming transshipment model which utilizes currently available transportation algorithms to achieve a minimum cost solution. This model structure proved particularly adept at estimating grain shipments as the least-cost solution reflected the combined costs of assembling, handling, and distributing the grain. While distribution issues varied between the commodities themselves, several general conclusions are clear within the grain market. 1) Approximately 36 percent of South Dakota grain is shipped by truck. Direct consideration of truck and rail shipping costs would increase the truck share to over fifty percent. 2) Truck and rail distribution services are close substitutes. Small changes in truck and rail rates result in relatively large substitution between modes. 3) The sensitivity of the distribution of grain to various terminals to changes in relative truck and rail shipping costs increases with the distance to the primary terminals. 4) With the present system of elevator grain handling, total grain marketing costs could be reduced up to six percent if all grain were shipped by the best cost mode to the terminals requiring the least shipping cost. Rail is also relatively underutilized particularly with reference to mineral and lumber shipments, due to a shortage of rolling stock and a deteriorated road bed.

## REFERENCES:

A Pilot Study to Investigate Efficient Transportation and Marketing Systems for South Dakota, Final Report, Vols. 1&2

PERFORMING AGENCY: South Dakota State University

INVESTIGATOR: Rudel, RK

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Canellos, G (Tel 202-4264420)

Contract DOT-OS-50229 (CS)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$89,723

ACKNOWLEDGMENT: TRAIS (PUR-50169)

22 080323

**DEVELOPMENT OF A MATHEMATICAL MODEL OF FREEZING AND THAWING IN A RAILCAR**

This study will develop a 3-dimensional heat transfer model of a railcar containing a moist granular material. Its objective is to permit rapid simulation studies of the movement of specific commodities under various freezing weather conditions to determine the extent and character of the

freezing process. It is part of the overall freezing research program. (See Colijn, Paterson) /RTAC/

## REFERENCES:

A Numerical Study of Freezing and Thawing of Bulk Materials During Rail Transportation, Oousthuizen, PH; Rush, CK, ASME, 75WA/HT-87, Nov. 1975

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 3.24.73

INVESTIGATOR: Oousthuizen, PH

SPONSORING AGENCY: Canadian National Railways; Noranda Research; Queen's University, Canada; Canadian Pacific

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1974 COMPLETION DATE: Apr. 1977

ACKNOWLEDGMENT: CIGGT

22 083444

**PREDICTED EFFECTS OF SELECTED POLICY AND TECHNOLOGY CHANGES ON THE GRAIN MARKETING SYSTEM**

In this project, the present grain marketing system will be compared with a simulated least cost system to identify and determine areas of inefficiency in the present grain marketing structure. Alternative government policies and technological developments that affect grain marketing will be selected and will be evaluated by using the spatial equilibrium models to assess the impact of changes on grain marketing system in the South. Progress Report: Arkansas utilization of manufactured feed is estimated to increase from 4.6 million tons in 1970 to 6.2 million tons in 1980. Approximately 900 thousand tons of this increase will be fed in Northwest Arkansas. Southwest Arkansas will need an estimated 428 thousand tons more than in 1970. The other two areas will need an increase of less than 200 thousand tons each. Northeast Arkansas would need 11 new feed mills to process the quantity of feed, if the optimum 78 thousand tons annual capacity plant was built. Southwest Arkansas would need 5 or 6 new mills of this capacity. With the trend toward increase in the percentage of feed being processed in the area of utilization and with 73% of the present feed mills producing less than 10,000 tons annually, the expansion in formula feed production may come from smaller mills. Procurement and distribution cash must be considered along with milling costs in determining the optimum size mill.

## REFERENCES:

Trends in Livestock Production-Predicted Effects of Selected Policy & Technology Changes on the Grain Marketing System, Morrison, WR, Ohio Agricultural Research and Development Center, SM-42, Regional Res. Rept. #1, Apr. 1973

PERFORMING AGENCY: Arkansas University, Fayetteville, Department of Agricultural Economics and Rural Sociology

INVESTIGATOR: Morrison, WR

SPONSORING AGENCY: Department of Agriculture, ARK00730

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1970

ACKNOWLEDGMENT: Current Research Information System (CRIS 0057175)

22 083483

**SYSTEM ANALYSIS OF THE ECONOMICS OF GRAIN MARKETING**

The purposes of this project are to: determine effects of changing farm program on efficiency of Marketing, Utilization and Distribution of Grain and Soybeans and their products; study changes in price relationships as a consequence of differences in location and production resulting from farm programs; ascertain changes in relative utilization of different grains in feeding of livestock and other uses; determine implications of farm programs for shipping patterns and quantities shipped to foreign markets; investigate operations of marketing systems as they affect both vertical and horizontal integration in marketing of grains. Approach: Secondary data will be supplemented by experimental data, farm records, previous studies, and from agencies and individual firms involved in various phases of the grain industry. Projections of production and consumption will be made. Major importing countries and instance of trade restrictions will be evaluated. U.S. price support programs, export subsidies, C.C.C. credit sales and inter-grain price relationships will be examined. Analysis will be made of emerging systems in terms of forces and incentives affecting closer vertical and horizontal interrelations, decision-making, and potential adjustments likely to be faced by firms in different segments of the industry. Progress Report:

A study of grain marketing patterns by Indiana farmers was carried forward, and a survey of truck shipments of grain by Indiana country elevators for the 1973-74 marketing year was initiated. A third study dealing with vertical coordination in cooperative grain marketing systems was completed and the results incorporated in a Ph.D. thesis. This study focused on evolving patterns of forward transfer within the cooperative system, with special emphasis on reasons for the loss of grain from the system between local cooperatives and their affiliated regionals. Possibilities for improved performance by regional cooperatives might include consolidation into larger organizations, diversification into processing and exporting grain, and general emphasis on flexibility and innovation in merchandising and procurement.

## REFERENCES:

Vertical Coordination in Cooperative Grain Marketing Systems, Schwartz, DR, Purdue University, Unpublished PhD Thesis, 1974

PERFORMING AGENCY: Purdue University, Department of Agricultural Economics, IND01732

INVESTIGATOR: Farris, PL

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Purdue University (CRIS 0060205)

## 22 083490

## SYSTEMS ANALYSIS OF WHEAT QUALITY

The purpose of the project is to discover and apply modern scientific management techniques to the wheat industry sector of the American economy for the twofold purpose of providing an improved basis for government policy decisions and increasing the efficiency of the performance of the individual firm serving agriculture to the end that costs of marketing wheat as a food and feed can be reduced. Specifically, this research is to develop a mathematical model of the wheat supply-marketing-demand complex to indicate the nature and extent of the major economic activities, measure the influence of change within the sector and determine how best to use the computer in practical application of the model as developed. Approach: Build econometric model of wheat industry in order to derive normative solutions with which to compare real world practices. Progress Report: This research analyzes the efficiency of the transfer of wheat and wheat products to the ultimate consumer. Mathematical models for several subsystems are currently in different stages of development. The subsystem to minimize freight costs is operational and has been successfully integrated for actual use to solve real-world problems. One large scale project has been completed in which the impact of a proposed change in the cost of shipping wheat was evaluated. Synthesis of costs for milling of wheat into flour for three sizes of flour mills have been developed to be incorporated into the general marketing systems model.

## REFERENCES:

Computerization of Wheat Mixes Niernberger, FF; Phillips, DP, Cereal Science Today, Amer. Assoc. of Cereal Chemists, Vol. 17, p 194, July 1972

Factors in Wheat Purchasing by Flour Mills. Proceedings of Wheat Marketing Field Day for Kansas Wheat Producers, Niernberger, FF, Kansas Agricultural Experiment Station, 1973

Wheat Mix Make-up Procedures Niernberger, FF; Ward, AB, Cereal Science Today, Amer. Assoc. of Cereal Chemists, Vol. 18, pp 125, Aug. 1973

Blending Wheat to Meet Product Specifications Niernberger, FF, Association of Operative Millers Technical Bulletin, pp 3395-3400, Sept. 1973

Trends in Wheat Economics. Proceedings of Wheat Marketing Field Day for Kansas Wheat Producers, Schruben, LW, Kansas Agricultural Experiment Station, 1974

Wheat Market Watchers Guide Schruben, LW, Kansas Agricultural Experiment Station, 1973

The Economics of Wheat to Flour. Proceedings of Wheat Marketing Field Day for Kansas Wheat Producers, Niernberger, FF, Kansas Agricultural Experiment Station, 1974

Evaluation of Wheat Tempering and Blending Models of Hard Winter Wheats Under Experimental Conditions, Posner, E; Ward, AB; Niernberger, FF, Association of Operative Millers Technical Bulletin, pp 3425-3438, Jan. 1974

PERFORMING AGENCY: Kansas State University, Food and Feed Grain Institute, KAN-05-017

INVESTIGATOR: Schruben, LW

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec. 1967  
ACKNOWLEDGMENT: Kansas State University (CRIS 0056748)

## 22 083506

## DETERMINE COSTS FOR DIFFERENT SYSTEMS FOR MARKETING POTATOES FROM THE GROWER TO THE RETAIL STORE

Objectives: Develop the least cost system(s) for handling, distribution, storing, processing and packaging potatoes by improving the efficiency for each function in the marketing systems. Approach: Establish the cooperation of growers, packers, processors, wholesalers, retailers and transportation firms to participate in the study. Run test shipments from the producing areas to the retail store level. Make industrial engineering studies, economic analyses and cost evaluation comparisons to determine the optimum system(s) for marketing potatoes. It will be necessary to enlist the aid of Federal and State agriculture extension personnel, land grant colleges, potato associations and the knowledge of other laboratories within the Agricultural Marketing Research Institute. Progress Report: Research was conducted and completed on two systems of harvesting and transporting California potatoes from field to packing shed. The harvesting system employing a truck and trailer combination, had total costs that were 18 percent lower than the system that used only the truck. Preliminary research was conducted on handling Long Island, Maine, and Florida potatoes. Research on packing shed operations in California and Florida is continuing to identify and measure packing costs. Unitized and palletized shipping of potatoes is being investigated.

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15842-001

INVESTIGATOR: Volz, MD Anthony, JP Bouma, JC

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1973 COMPLETION DATE: May 1978

ACKNOWLEDGMENT: Current Research Information System (CRIS 0040246)

## 22 083511

## IMPROVED SYSTEMS FOR SHIPPING AND HANDLING GROCERIES FROM MANUFACTURER TO WHOLESALE WAREHOUSE

The objective of this project is to measure the cost for less-than-truckload (LTL) shipments of groceries from manufacturer to wholesaler and determine the feasibility of reduced cost with a regional warehouse to store products of several manufacturers and ship full truckloads of grocery products from several manufacturers. Basic information relative to volume of groceries shipped from manufacturer to wholesaler by less than truckload, truckload, and rail car is being obtained. Research advantages and disadvantages of various unitload handling systems from supplier to distribution warehouse, and to determine the feasibility of shipping smaller unitloads such as 40 inch by 32 inch. The need for this research is great because the industry pallet exchange program is not working satisfactorily.

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15864-001

INVESTIGATOR: Bouma, JC

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1973

ACKNOWLEDGMENT: Current Research Information System (CRIS 0040668)

## 22 083516

## CONTROL OF DAMAGE AND LOSS IN DISTRIBUTION

This project is concerned with the reduction of distribution costs through more effective packaging. The objectives are to find characteristics of commodities and items which are damaged in distribution; to determine the causes of damage; to study characteristics of the distribution environment encountered in handling, storage and movement; to evaluate numerous packaging materials; to propose methods of damage prevention and to develop an economics of distribution loss control. The approach is as follows: analyze damage histories for specific commodities and items; evaluate packaging systems through laboratory test methods that reflect environmental hazards and reproduce field failures; specify performance levels for product/package combinations and determine cost factors involved in applying alternative solutions to problems. Results include

techniques for redesigning products to reduce packaging requirements, methods for comparing performance effectiveness of various packaging system components and methods for predicting the performance of packages.

PERFORMING AGENCY: Michigan State University, East Lansing, School of Packaging, MICL 03108  
 INVESTIGATOR: Goff, JW  
 SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1971

ACKNOWLEDGMENT: Michigan State University, East Lansing (CRIS 0060632)

**22 083527  
 SYSTEMS ANALYSIS OF THE ECONOMICS OF GRAIN  
 MARKETING**

The objective of this project is to investigate the operations of marketing systems as they affect the economics of physical distribution and processing of grains. Managerial decision-making by grain marketing firms will also be investigated. A spatial equilibrium model of the grain marketing system will be developed to determine the optimum size, type and number of firms. Parametric programming will be used to simulate various conditions of supply, demand, technology and transportation rates and the effects on the market structure will be traced within the model. The project will examine existing managerial decision-making models for grain marketing firms and adopt or create new models. Operating parameters and external constraints of marketing firms will be analyzed. Data will be obtained from private and public agencies including EDP companies and trade associations. Management Systems-A financial planning system for diversified grain marketing and farm supply firms was developed and tested. The system includes a monthly and an annual budgeting process, a monthly and an annual cash flow analysis based upon budgeted expectations, and instructions for completing and using the budgets and the cash flow analysis. This system is designed to aid the manager and owners in planning and controlling the financial well being of the business. It deals specifically with sales volume, price policy, expense control, credit policy, capital requirements, and repayment ability. Physical systems-A Nebraska grain producers survey has been completed. It measured harvesting methods and on-farm drying and storage capacity. A survey of 30 country elevators was also completed. This survey determined physical capacities and transfer of ownership patterns and will be used as input to a regional analysis.

REFERENCES:  
 Grain Drying and Storage Systems Lytle, PW; Kniep, MD, Nebraska Quarterly, Vol. XX, No. 3, Sept. 1973

PERFORMING AGENCY: Nebraska University, Lincoln, Department of Agricultural Economics, NEB-10-061  
 INVESTIGATOR: Turner, M Lytle, PW  
 SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Nebraska University, Lincoln (CRIS 0060246)

**22 083543  
 SYSTEM ANALYSIS OF THE ECONOMICS OF GRAIN  
 MARKETING**

The objective is to investigate the operations of marketing systems as they affect: (1) The economics of physical distribution and processing of grains; (2) managerial decision-making by grain marketing firms. A spatial equilibrium model of the grain marketing system will be developed to determine the optimum size, type and number of firms. Parametric programming will be used to simulate various conditions of supply, demand, technology and transportation rates and the effects on the market structure managerial decision-making models for grain marketing firms and adopt or create new models. Operating parameters and external constraints of marketing firms will be analyzed. Data will be obtained from private and public agencies including EDP companies and trade associations. Data on storage capacities of existing grain facilities was compiled and used as a basis for selecting alternative plant sizes to be considered in the model. Areal delineations were made and production and consumption estimates were obtained corresponding to these areas. Direct and published sources were used to obtain truck and rail transportation rates. Selected elevators in each size group were surveyed to obtain operating cost data and information

concerning operating revenues and annual storage and handling volumes. Annual expense budgets were developed for each size group to determine operating cost per unit of grain. A spatial equilibrium model of the subject area's grain marketing system is being constructed. The spatial equilibrium model is constructed so that the parameters in the model can be changed to depict alternative conditions of supply, demand and technology and thus permit their effects on the system to be analyzed. The introductory, theory and methodology sections of the research report have been written. /CRIS/

PERFORMING AGENCY: Oklahoma State University, Department of Agricultural Economics, OKL01521  
 INVESTIGATOR: Oehrtman, RL  
 SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Current Research Information System (CRIS-0060577)

**22 083556  
 THE FEASIBILITY OF DEVELOPING ADDITIONAL BEEF  
 PROCESSING FACILITIES IN SOUTH DAKOTA**

The objective of this research is to determine the feasibility of developing additional beef processing facilities in South Dakota. Associated objectives include: Estimate costs of kill and chill plants; estimate costs of breaking facilities; estimate transportation rates; simulate the coordinated development of beef production with beef processing and transportation systems in South Dakota. The method used will be a systems analysis approach based on a transportation model. Data for the model will be derived by cost feasibility analysis of beef processing plants. Transportation rates will be obtained by regression analysis of rates provided by the railroads, P.U.C. and the trucking industry.

PERFORMING AGENCY: South Dakota State University, Department of Economics  
 INVESTIGATOR: Rudel, RK  
 SPONSORING AGENCY: Department of Agriculture, SD00656

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Current Research Information System (CRIS 0063916)

**22 099623  
 FUTURE ECONOMIC ADJUSTMENTS IN THE MARKETING OF  
 SELECTED NORTHEAST FRUITS AND VEGETABLES**

Determine the economic impact of changes in consumption and buying patterns for apples, potatoes and tomatoes in fresh and/or processed form in the Northeast on: cost, margins, and price making practices at each transfer point in the marketing channels. Producer decisions concerning alternative markets.

Conduct a mail survey to evaluate the usefulness of market information currently available to potato growers. Analyze the nature and extent of the impact of potato market information upon the price making mechanism. Review the basic objectives for and alleged advantages and disadvantages of trading in Maine potato futures, and investigate the alternatives for improving flow patterns of nonregulated trucks for Maine, and the Boston and the New York market areas. Identify shortages in supply (trucks available for loading) and the causes, investigate means of alleviating shortage in supply to specific areas. Analyze capabilities of existing potato storage and marketing facilities, and relate to projected changes in market channels.

Analysis of truck shipment data concerning availability of trucks from origins to destinations, and seasonality of movements of Maine potatoes showed 25,000 to 31,000 truckloads of potatoes per season shipped from Maine in past 4 marketing seasons. About 1/2 of shipments were in March, April, and May each year. About 1/3 of shipments went to New England points and 2/5 to New York, New Jersey, and Penn. Truck shortages reported 45 and 35% of time in past 2 seasons. Truck vs rail freight rates compared. Recent and proposed changes prompt reevaluation. Analysis of Maine tablestock potato shipments described marketing characteristics for the 1966-1972 Crop years. Deadheading problem for specific carrier was analyzed. A 30% response obtained to mail survey of number and capacity of potato storage facilities. Follow-up questionnaire drifted. Regression analysis indicated information on potato production, wholesale market unloads, and storage stocks of frozen french fries was nearly wholly reflected in Maine cash and futures potato prices. Differences between monthly estimates and the revised annual figures were calculated for both acreage

planted and production of potatoes in the Fall states. Performance of the estimates improved over the 1950-1943 study period.

## REFERENCES:

An Analysis of the Impact of Market Information Upon Maine Potato Prices, Green, RC, Maine University, Department of Agr. & Resources Economics, Masters Thesis, June 1974

Marketing Characteristics in Shipments of Maine Tablestock Potatoes, Johnston, EF; Pelsue, NH, Jr, Maine University, Maine Experiment Station, Mis. Rpt. No 163, Sept. 1974

POTATOES: Planting and Production Estimates, Research in the Life Sciences, Pelsua, NH, Jr, Maine University, Life Sciences & Agr. Experiment Station, V22 N4, Nov. 1974

PERFORMING AGENCY: Maine University, Department of Agricultural and Resource Economics

INVESTIGATOR: Johnston, EF Pelsue, HN, Jr

SPONSORING AGENCY: Department of Agriculture, ME00293

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Current Research Information System (CRIS 0064637)

22 099624

### IMPROVING TRANSPORT AND HANDLING OF CONCENTRATED FORAGE PRODUCTS TO OVERSEAS MARKETS

Develop and evaluate improved methods and equipment for transporting and handling overseas shipments of concentrated forage products.

Evaluate present forms and methods of concentrating forage products, and handling, storing, transporting and using the products. Determine how these steps interface and the effect of such interfacing. Develop improved equipment and techniques or modifications of present technology. Evaluate improvements in commercial shipping experiments to overseas markets. Determine comparative handling and transport efficiencies in terms of physical performance and costs. Recommend best equipment and methods and develop guidelines for their use.

Evaluation of grass seed residue industry current practices indicate: Major manufacturing problem is difficulty in achieving a proper density of 25 lbs. per cu. ft. or less; moisture level below 10 percent; and flat rate charges per container (\$200 per 20 foot and \$300 per 40 foot van) resulting in high transport cost because of low density of current product shipped. Technical problems such as the drying process for cubes, densification and recompressing of bales have not been solved as yet. Availability of containers--steamship lines will allocate their containers to highest paying cargo--is also a current problem.

PERFORMING AGENCY: Agricultural Research Service, Western Region Oregon-Washington Area

INVESTIGATOR: Fountain, JB

SPONSORING AGENCY: Department of Agriculture, 5805-15880-001

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1973 COMPLETION DATE: Nov. 1978

ACKNOWLEDGMENT: Current Research Information System (CRIS 0040669)

22 099626

### SYSTEMS ANALYSIS OF THE ECONOMICS OF GRAIN MARKETING

Determine effects of changing farm programs on efficiency of Marketing, Utilization and Distribution of Grain and Soybeans and their products: Study changes in price relationships as a consequence of differences in location and production resulting from farm programs. Ascertain changes in relative utilization of different grains in feeding of livestock and other uses. Determine implications of farm programs for shipping patterns and quantities shipped to foreign markets.

Secondary data will be supplemented by station experimental data, farm records, previous studies and from agencies and individual firms involved in various phases of the grain industry. Grain marketing system will be approximated by a spatial equilibrium model determining the optimum size, type, and number of firms. Projections of grain production and consumption

will be made. Time series data will be analyzed and related to the long and short run demand. U.S. price-support programs, export subsidies, C.C.C. sales and inter-grain price relationships will be analyzed. Programs and policies of importing countries and measurement of incidence of trade restrictions will be evaluated for U.S. exports.

The regional project has concentrated on a survey of country elevators and Wisconsin did not participate because a similar survey was conducted in Wisconsin under another project which duplicated the interests of the regional project. The investigator attended the meetings of the Technical Committee of NC-104. The April meeting included a seminar with the Kansas City Board of Trade and the October meeting included a seminar with the staff members of the Continental Grain Company. The investigator will continue to meet with NC-104 technical committee.

PERFORMING AGENCY: Wisconsin University, Madison, Department of Agricultural Economics

INVESTIGATOR: Peterson, G

SPONSORING AGENCY: Department of Agriculture, WIS01819

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Current Research Information System

22 099629

### ORGANIZATION AND MANAGEMENT OF FARM SUPPLY FIRMS

Identify and evaluate the potential impact on firms of changes in structure and operating methods of farm supply industries. Develop and test management practices and procedures for farm supply industry firms.

The existing market structure for Missouri farm supply industries will be determined. Expected changes in industry structure will be identified. The potential impact of structural change on industry firms will be examined. As new products or practices are introduced, their potential impact on the operations of individual firms will be studied. Operations research and simulation techniques will be adopted to the types of managerial problems faced by agribusiness firm managers. Areas of work which will receive attention include local distribution, inventory control, and management planning.

Computer analysis has been completed on a study of the market structure of fertilizer retailing in Missouri. Basic information on feed enterprises has been assembled for a financial simulation model for farm supply firms. The model will allow evaluation of changing conditions upon elevator operations. The model will assist managers in long range planning. A contributing project designed to evaluate fertilizer inventory policy for farm supply firms has been designed to evaluate fertilizer inventory policy for farm supply firms has been developed. Preliminary data has been gathered. The model to be developed will assist managers in optimizing inventory. A survey of approximately 80 country elevators to determine storage, capacity, handling facilities, transportation facilities and grain receipts by months was completed for a 16 county area in N.W. Missouri. This will be useful as background information on the grain industry as well as input data for a location-transshipment model to be used as a basis for transportation decisions in the area. A survey and analysis of farm to market grain transport, methods and costs has been completed. The analysis will be useful in making cost-reducing and energy-conserving decisions in the handling and marketing of grain. A statement on agricultural transportation needs and problems has been provided to the Missouri Department of Agriculture and the State Transportation Policy Council for use in transportation policy and planning studies at state level.

## REFERENCES:

Transportation Change and Missouri's Agribusiness Future Moser, DE, Missouri University, Columbia, Extension Division, Agri-Business Newsletter, Mar. 1974

Transportation Problems and Policy Concerns of Agriculture Moser, DE, Missouri University, Columbia, Extension Division, Agri-Business Newsletter, Nov. 1974

PERFORMING AGENCY: Missouri University, Columbia, Department of Agricultural Economics

INVESTIGATOR: Devino, GT Moser, D

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Feb. 1974

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1972

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 649071)

ACKNOWLEDGMENT: Current Research Information System (CRIS 0061002)

**22 099631**

**PACKAGING, TRANSPORT, AND STORAGE EFFECTS ON CONDITION AND DISTRIBUTION OF FRESH BEEF**

Determine the effectiveness and costs of different types of treatments, packaging, handling, and transportation environments on maintenance of quality, shelf-life, and consumer acceptability of fresh beef.

Studies designed to evaluate the effects of three types of refrigerated transport trailers--(1) standard, (2) vacuumized, and (3) controlled atmosphere--will be conducted to determine the operation costs and effects on condition for beef quarters and other wholesale beef cuts. Studies on packaging of boxed wholesale and institutional-type beef cuts prepared under different packaging systems and employing different types of films will be conducted to evaluate their effects on condition during storage and transport. Appropriate retail cuts will be prepared from the boxed wholesale beef cuts to study and determine the shelf-life of the retail cuts.

PERFORMING AGENCY: Texas A&M University, Agricultural Experiment Station

INVESTIGATOR: Carpenter, ZL Hoke, KE

SPONSORING AGENCY: Department of Agriculture, 1090-15842-010-A

Contract 12-14-1001-407

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974

ACKNOWLEDGMENT: Current Research Information System (CRIS 0041163)

**22 099635**

**POTENTIAL FOR EXPANDING GRAIN STORAGE IN NEW ENGLAND AND ACHIEVING FREIGHT RATE REDUCTIONS**

The problem is high transportation rates on feed grains into New England as compared to the Southeast. Present rates are clearly discriminatory. In the absence of discriminatory rates, minimum transportation costs cannot be achieved without a "reorganization" of the feed industry. Water-rail alternatives will be considered.

Obtain present storage capacity and unloading facilities. Determine number of grain consuming animal units for 80, 85, and 1990. Determine minimum number of days of available feed. Compare costs of storage in Mid-West and New England. Compare transportation of the present with costs after storage capacity is increased.

It has been shown that the corn markets in the mid-west are part of a single-priced market structure and that weekly prices in Cincinnati and Toledo, move together. R sq over 0.95 were obtained when correlating weekly prices in the two markets. Freight rates on corn from country elevators to river crossings on southern movement is 70-80 percent of the rate from country elevators to terminal markets supplying corn to New England. Efforts are currently underway to ascertain the economic feasibility of modernizing and reorganizing the feed storage and milling industries of New England to take advantage of unit train tariff rates established for shipments of raw grain. to data a list of feed mills and grain storage facilities has been compiled which identifies the current structure of industry in New England. These firms have been surveyed to obtain data on their feed grain receiving and storage capacities, milling capacities and retail and wholesale marketing parameters. Progress also has been made in developing economy of scale schedules for feed grain storage centers. Synthesized schedules have been developed showing the various per unit costs attached to changes in the size of elevator storage areas. Also estimates on the investment requirements to expand feed grain storage facilities have been synthesized.

**REFERENCES:**

Verified Statement Before Interstate Commerce Commission Seaver, SK, Interstate Commerce Commission

PERFORMING AGENCY: Connecticut University, Storrs, Department of Agricultural Economics

INVESTIGATOR: Seaver, SK Farrish, RO Hanekamp, WJ

SPONSORING AGENCY: Department of Agriculture, CONS00452

**22 099636**

**ECONOMICS OF CONSUMPTION, DISTRIBUTION, AND PRODUCTION OF SECONDARY MANUFACTURED WOOD PRODUCTS**

Improve the efficiency of performance of the markets for secondary manufactured wood products in Eastern United States in satisfying the needs of society and using available resources effectively.

The major research will be concerned with the pallet, furniture, and flooring industries. Studies will seek to determine the optimum raw material mix. Industrial trends and consumer preferences will be studied. Wooden pallet standards will be developed. Studies will be made to develop a model for optimizing the flow of pallets to meet the demands for shipment, handling and storage of product. This will include evaluation of a pallet exchange pool. Other studies will be concerned with developing alternatives to the labor intensive nature of the production of many wood products.

A body of fundamental physical and economic relationships has been established from the study of the performance of wooden pallets in pallet exchange programs. For the first time, it is possible to differentiate between different degrees of quality in pallets. Quality standards and specifications have now been written to produce pallets that will reduce the average cost per use 80 percent as compared with normal warehouse pallets. The U.S. Postal Service has adopted these standards and introduced an \$8 million palletized mail program. National Pallet Leasing Systems, Inc. in contract with Sears, has also adopted these standards and have instituted a pilot pallet exchange program with their suppliers. As the program is expanded, it will ultimately include about 3000 of Sears suppliers. The nucleus of what could become a National Pallet Exchange program is now in operation.

**REFERENCES:**

Required Pallet Research: Economic Aspects Opportunities for Virginia's Pallet, Industry, Proceedings, Wallin, WB, VPI & State University, 121, pp 32-38, 73

The Performance of Wooden Pallets in Pallet Exchange Programs, Sardo, WH, Jr; Wallin, WB

Quality Distribution of Pallet Parts From Low-Grade Lumber Large, HR; Frost, RE, USDA Forest Service Research, Paper NE-266, 6pp, illus, 1974

Factors Influencing the Selection of State Office Furniture Anderson, RB, USDA Forest Service Research, Paper NE-266,6 pp, illus., 1973

Factors Affecting the Use of Hardwood Flooring in Urban Rehabilitation, Nevel, RL, Jr, USDA Forest Service Research, Paper NE-273, 7 pp, illus., 1973

PERFORMING AGENCY: Northeastern Forest Experiment Station

INVESTIGATOR: Martens, DG

SPONSORING AGENCY: Department of Agriculture, NE-4304

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1967 COMPLETION DATE: Apr. 1978

ACKNOWLEDGMENT: Current Research Information System (CRIS 0023183)

**22 099637**

**IMPROVED PACKAGING OF AGRICULTURAL PRODUCTS**

Reduce product damage, develop and evaluate new materials or ways of using substitute packaging materials for those in short supply that will reduce the cost of packaging, handling, and transport of perishable agricultural products.

In cooperation with package and container manufacturers develop new containers, packages, or packaging materials such as air cushion bags and plastic corrugated boxes. Test the physical performance of such materials in protecting the packaged product in the laboratory, commercial packing plants, and through distribution systems. Gather data on cost of materials, packing, handling, storage, transport, and distribution and data on the suitability of the new containers, packages, or packaging materials for meeting the requirements of the marketing system and consumers of the product. Compare the cost of using the new packages, containers, or

packaging materials and the efficiency with which they can be packed, shipped, and handled on pallets or in some other type of unit load with conventional forms of packaging in current use.

In cooperation with package materials manufacturers, new air cushion pads--film bags inflated with air--were developed and tested in the laboratory and under field conditions for immobilizing and cushioning bulk and tray packs of apples. Apples packed in pulpboard and polystyrene shipping trays and overwrapped with shrink film were test shipped by the Yakima, Washington Packaging laboratory and evaluated by the AMRI, TPRL package researchers. Newly developed corrugated high density polyethylene shipping containers were also tested for the shipment of celery and cut flowers. The design of the corrugated polyethylene containers in being modified to provide more ventilation and protection to the product. Analysis of data collected on the evaluation of 3-pound size consumer trays for McIntosh apples was completed.

**REFERENCES:**

Economic Aspects of Prepackaging Stokes, DR, OECD, Paris France, Doc No. DAA 1066, Mar. 1974

**PERFORMING AGENCY:** Agricultural Marketing Research Institute, Transportation and Packaging Research Laboratory

**INVESTIGATOR:** Stokes, DR

**SPONSORING AGENCY:** Department of Agriculture, 1104-15841-001

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** Oct. 1968 **COMPLETION DATE:** May 1977

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0020042)

**22 099638**

**EVALUATE SYSTEMS FOR HANDLING AND TRANSPORTING FROZEN FOOD FROM PROCESSING PLANT TO WHOLESALE**

Determine and evaluate various systems for handling and transporting frozen food from processing plant to wholesaler and to develop methods for improving the efficiency for the total system.

This project will be conducted in cooperation with the American Frozen Food Institute which will assist in establishing industry contacts and evaluating research findings. Project leadership will be provided by the Market Operations Research Laboratory. The objectives will be approached by detailed studies of the layout, methods, equipment, and labor required in processor warehouses on frozen foods from storage through loading of transport vehicles; at public or regional frozen food warehouse on receiving, storing, and loading, and at wholesale warehouse on receiving and storing frozen foods. Evaluations will be made of various systems for handling and transporting frozen food from the processing plant to wholesale warehouses and if possible, develop systems that will reduce the cost. Labor, equipment, methods and handling costs at the various facilities for different systems will be analyzed and evaluated.

Studies were initiated to determine the most economical systems for handling and transporting frozen foods from processing plant to wholesalers, including direct shipments and through regional and public warehouse. Preliminary studies were made in four processing plants in New Jersey, Maryland, and Virginia to try to determine the magnitude and complexity of frozen food products, handling, and marketing characteristics, and to determine what aspects of the frozen food industry would be studied first. Plans were made to analyze the major marketing systems from processing plant to wholesaler with emphasis on obtaining labor, equipment, and material inputs and costs on the distribution systems studied. Research was completed at two public refrigeration warehouses and at a corporate chain warehouse. Research has been initiated on handling methods and loading costs, both manual and unitized, in four processing plants in Florida.

**PERFORMING AGENCY:** Agricultural Marketing Research Institute, Market Operations Research Laboratory

**INVESTIGATOR:** Mongelli, RC

**SPONSORING AGENCY:** Department of Agriculture, 1104-15864-004

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** May 1974 **COMPLETION DATE:** May 1979

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0041067)

**22 099639**

**SYSTEMS FOR MARKETING BEEF FROM SLAUGHTERHOUSE TO RETAIL FOOD STORE**

Determine costs for various systems of marketing beef from slaughterhouse to retail food store and to develop improvements in these systems or develop a composite of two or more systems that would reduce marketing costs. Leadership will be provided by the Market Operations Research Laboratory. The objective will be met by detailed cost studies of 11 different systems for marketing beef. Cost data will be gathered from 16 firms including slaughterers, packers, central processors, and retail stores. Data gathered will include transportation methods and cost, labor cost and productivity, cutting losses, product shrinkage, description of methods, and other pertinent information. Most information will be based on company records with labor costs verified by time studies. Upon completion of data gathering, an analysis will be made to determine the most efficient system. Following this, field tests will be implemented to verify findings as to the system that appears to hold the greatest potential for cost reduction.

**PERFORMING AGENCY:** Agricultural Marketing Research Institute, Market Operations Research Laboratory

**INVESTIGATOR:** Goulston, CL

**SPONSORING AGENCY:** Department of Agriculture, 1104-15864-005

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** Aug. 1974 **COMPLETION DATE:** Aug. 1977

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0041735)

**22 099640**

**MAINTAINING AND IMPROVING QUALITY AND MARKET LIFE CALIFORNIA-ARIZONA CITRUS IN FOREIGN MARKETS**

Determine the effects of transit temperatures and relative humidities, postharvest fungicidal treatments, and handling, packaging, palletizing and containerization on arrival condition and appearance, quality, and market life of California-Arizona citrus in foreign markets.

Ship citrus fruit, or hold in simulated transit conditions, after treating with individual or combinations of fungicides. Determine fungicide concentrations necessary to control storage decays and fruit spoilage. Determine fungicide residues on or in fruit at time of treatment and upon arrival in Europe or Japan. Develop and improve analytical methods for fungicides now used or expected to be used, as needed. Compare palletized and hand stacked shipments in mechanical and iced rail cars and containers for fruit cool-down rates, uniformity of fruit temperature control, and fruit injury and carton deterioration due to cargo shifting during loading, unloading and in transit.

Oranges treated with high and low thiabendazole (TBZ) levels were run through a Sunkist Grower's Inc. citrus products pilot plant. TBZ residues were measured on whole fruit, wet pulp, juice, molasses, oil, and dry citrus pulp cattle feed. TBZ stability was determined by analyzing the cattle feed every two weeks for 12 weeks. Data is being used in establishing a U.S. 10 ppm TBZ tolerance on fresh citrus. Industry-USDA cooperative shipping tests showed warm citrus sent to eastern US markets in mechanically refrigerated rail cars was poorly cooled, especially in the "B" end of cars. Hand-stacked chimney-vented loads cooled better than solid, palletized loads. Receivers increasingly prefer palletized shipments. Two tests, a simulated shipping test and an actual shipment, indicate feasibility of shipping field-run nontreated oranges in bulk bins via refrigerated ship van containers to foreign countries. Chief advantages appear to be reduction in cost (fruit shipping carton cost is avoided and fruit is cleaned, graded and packed in foreign countries), and avoidance of pesticide and food additive legal restrictions in some countries. A thin-layer chromatographic method is being developed to measure behomyl residues on citrus. The station was moved from Pomona to the UCR campus, Riverside during the year. Research progress was somewhat restricted because of the transfer.

**PERFORMING AGENCY:** Agricultural Research Service, Market Quality Laboratory

**INVESTIGATOR:** Hauck, LG Norman, SM

**SPONSORING AGENCY:** Department of Agriculture, 5210-15880-001

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** Mar. 1974 **COMPLETION DATE:** Mar. 1979

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0041023)



22 099641

**MAINTAINING QUALITY IN EXPORTED TEXAS FRUITS AND VEGETABLES**

Determine the most effective methods for protecting, fruits and vegetables exported to foreign markets.

Explore packaging and unitization systems as they relate to citrus fruit quality during overseas shipment and movement throughout foreign market channels. Factors including temperature, relative humidity, and atmospheric composition will be monitored during accompaniment of shipments. Stacking patterns will be tested to determine the most effective utilization of the ship's ventilation system. Based on the above relationships, recommendations will be made with respect to minimizing losses and maintaining quality of exported fruits and vegetables.

PERFORMING AGENCY: Agricultural Research Service, Nematology Research Laboratory

INVESTIGATOR: McDonald, RE

SPONSORING AGENCY: Department of Agriculture, 7202-15880-002

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: July 1977

ACKNOWLEDGMENT: Current Research Information System (CRIS 0041394)

22 099642

**MARKETING MARGINS AND COST COMPONENTS IN THE OIL CROPS INDUSTRY**

Determine price spreads and cost components in producing, transporting, storing, and manufacturing oil crops and major products; and relate changes in structure, technology, and practices to changes in prices, margins and costs.

Determine farm-to-retail price spreads from secondary data and develop cost components from special studies and surveys, using economic-engineering data and budget analyses. Develop costs for producing, storing, transporting and manufacturing oil crops and major products with initial attention being given to costs of manufacturing margarine, cooking and salad oil, and crushing soybeans.

Initiated work in cooperation with Virginia Polytechnic Institute and State University to provide cost component data for the manufacture of cooking oil, salad oil, and margarine. Advised the VPI group on a number of industry contracts and furnished them with considerable reference material to avoid duplication of effort. Collection of cost component data for the solvent extraction of soybeans is in progress.

PERFORMING AGENCY: Economic Research Service, Department of Agriculture

INVESTIGATOR: Doty, HO

SPONSORING AGENCY: Department of Agriculture, CE-07-062-11-00

STATUS: Active NOTICE DATE: July 1975 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information System (CRIS 0041588)

22 099643

**ORGANIZATION AND EFFICIENCY OF THE PRODUCTION AND MARKETING SECTOR FOR OIL CROPS**

Develop a structural schematic for producing, storing, processing, and distributing products in the oil crops industry. Analyze the competitive position of the oil crops industry with competing commodities and with the same commodities from competing countries. Evaluate the impacts of changes in economic, technical, and regulatory factors on the organization and efficiency of the oil crops industry.

Determine the present economic structure of the oil crops industry and quantify the product flow through the various marketing channels as background to the development of the oil crops research program. Evaluate marketing patterns, regional competition, stock management and storage and transportation problems. Develop a spatial-temporal model for soybeans to analyze the impacts on industry organization and efficiency of changes in supply, demand, cost and institutional factors.

Developed and published a model to analyze the spatial-temporal flow of soybeans and corn. The model uses separable programming as the solution algorithm. Prepared an unpublished report "Optimal Solutions Involving Cross-Product Relationships Through Separable Programming". This report outlines the problems associated with including cross-product coefficients in a programming model and shows how they can be overcome.

REFERENCES:

Storage Utilization in a Deficit Region Boutwell, A; Kenyon, E, Southern Journal of Agricultural Economics, V5, N1, pp 233-237, July 1973

Grain Storage in the Deficit South Atlantic Region Kenyon, E; Boutwell, A, VPI and State University, Research Division, Bull N90, 69 pp, May 1974

PERFORMING AGENCY: Economic Research Service, Department of Agriculture

INVESTIGATOR: Boutwell, WA

SPONSORING AGENCY: Department of Agriculture, CE-07-064-11-00

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information System (CRIS 0041590)

22 099648

**IMPROVED TRANSPORT EQUIPMENT AND TECHNIQUES FOR OVERSEAS SHIPMENTS OF CITRUS FRUITS AND VEGETABLES**

Improve packaging, palletization, and transport to reduce overseas marketing costs of fresh fruits and vegetables.

Develop better shipping containers, palletization methods, transport modes, and handling procedures for exporting fresh fruits and vegetables. Emphasis on developing less expensive cartons for "in register" stacking patterns that can be palletized to permit greater air circulation for product maintenance. Data on carton and product condition, air circulation, product temperatures, atmospheres, trade reaction, cost of materials, packing, palletizing, handling and transport costs will be obtained at the time when experimental shipments are made.

PERFORMING AGENCY: Agricultural Research Service, Market Quality Research Laboratory

INVESTIGATOR: Camp, TH

SPONSORING AGENCY: Department of Agriculture, 7302-15880-001

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1974

ACKNOWLEDGMENT: Current Research Information System (CRIS 0041734)

22 100472

**THE ECONOMICS OF PRODUCT ASSEMBLY AND DISTRIBUTION**

This project is for the purpose of conducting field trials to prove the practicability of research discoveries. It is attempting to develop a body of economic knowledge concerning the relationships between costs and physical handling of farm products. It will assemble rates charged for transport by truck, rail, barge, air, and pipeline, and relate these to the warehousing and inventory practices of agribusiness firms as these effect marketing costs of farm products and purchased supplies. /SIE/

PERFORMING AGENCY: Kansas State University, Agricultural Experiment Station

INVESTIGATOR: Schruben, LW

SPONSORING AGENCY: Kansas, State of, 0061020 KAN-05-231

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1972

ACKNOWLEDGMENT: Kansas State University, Smithsonian Science Information Exchange (GY 61020 2)

22 129704

**RAIL COMMODITY SERVICE ANALYSIS**

This program focuses on improving the efficiency of transporting principal commodities by rail. Specifically, the potential for large-scale productivity improvements in the physical distribution systems of principal rail-carried commodities is being assessed.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development

RESPONSIBLE INDIVIDUAL: Cantey, W

STATUS: Proposed NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

22 129732

**A LONG-TERM STUDY OF TRANSPORTATION AND DISTRIBUTION OF PERISHABLE FOODS**

This four-part study will include an examination of the logistics systems alternatives for fruits and vegetables in the states of California, Washington, Texas and Florida. The report will summarize chief characteristics of the perishable food products industry with special emphasis on current production, marketing and distribution problems arising from the industry's structure and transportation requirements. Present and possible alternative food distribution patterns and their costs will be examined. In addition, an assessment will be made of available technology for handling and transporting these commodities. Recommendations for the most cost-effective alternatives for perishable food distribution will be developed.

Subcontractor: Reebie Associates.

PERFORMING AGENCY: Manalytics, Incorporated  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Newkirk, JL (Tel 202-426-0771) Boone, JW

Contract DOT-FR-65024

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1975 TOTAL FUNDS: \$627,000

ACKNOWLEDGMENT: FRA

22 134796

**SYSTEM FOR HANDLING AND TRANSPORTATION OF TRANSURANIC CONTAMINATED WASTE**

The purpose here is to provide an integrated study and development of a standardized packaging, package container, handling, and transportation system for the safe, timely, and economical relocation of transuranic waste. The following situations will be considered: (1) interim retrievable storage; (2) pilot permanent repository; (3) permanent repository. The approach to this problem emphasizes coordinating and balancing the requirements of the various elements of the TRU waste chain.

PERFORMING AGENCY: Rockwell International Division, International Atomics, AL 2117A  
 INVESTIGATOR: Merlini, RJ (Tel (30) 497-2631)  
 SPONSORING AGENCY: Energy Research and Development Administration  
 RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-3561)

Contract E-(29-2)-3533

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$105,000

ACKNOWLEDGMENT: Energy Research and Development Administration

22 135001

**ALTERNATIVE SYSTEMS FOR TRANSPORTING AGRICULTURAL OUTPUTS TO MARKET AND INPUTS TO PRODUCTION AREAS**

OBJECTIVE: Determine the optimal transportation systems and facilities for transporting grain and fertilizer to maximize producer income. APPROACH: Estimate demand for transportation; estimate costs of alternative modes and handling facilities; estimate optimal transportation modes, system and location and types of facilities. PROGRESS: Principal progress to date has been collection of existing cost data for fertilizer handling and initiation of estimates of cost of transporting fertilizer by various modes of transportation.

PERFORMING AGENCY: Iowa State University, Ames, Agricultural Experiment Station  
 INVESTIGATOR: Baumel, CP  
 SPONSORING AGENCY: Department of Agriculture, Iowa Cooperative State Research Service, 0065178 IOW02016

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 65178 1)

22 135610

**ECONOMICS AND DESIGN OF ALTERNATIVE TRANSPORTATION SYSTEMS FOR AGRICULTURE AND RURAL AREAS**

OBJECTIVE: Analyze the economics and design of alternative transportation systems for agriculture and rural areas; evaluate the consequences of

various economic and technological changes on the transportation system used to move production inputs to the farm and farm products from farms to market; develop and analyze alternative financial methods of maintaining rail lines that have been classified as excess by federal regulatory officials but considered essential by state authorities or local interests. APPROACH: Describe the transportation system used to move commodities into and through a selected rural area; develop the methodology and mathematical models necessary to analyze alternative transportation systems; collect, develop, and analyze the necessary transportation costs, commodity supplies and product demands. PROGRESS: The geographical region presently being served by the Canastota-Vernon branch rail line has been selected for analysis. The method of analysis has been specified and data collection has been initiated. A physical distribution audit of one of the major users of the rail line has been scheduled.

PERFORMING AGENCY: Cornell University, Department of Agricultural Economics

INVESTIGATOR: Lifferth, DR (Tel (315) 256-5464)

SPONSORING AGENCY: Department of Agriculture, New York Cooperative State Research Service, 0065824 NYC-121448

RESPONSIBLE INDIVIDUAL: Van Demark, NL

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 65824), Cornell University

22 136086

**A SAFETY AND ECONOMIC STUDY OF SPECIAL TRAINS**

The aim of the project is to evaluate the safety and economics of special trains for the shipment of nuclear fuel cycle materials and compare them with those of regular trains. The transportation system and shipments affected will be identified; the economic and logistics aspects of special trains will be evaluated; safety of such trains will be assessed; and the costs and benefits of special trains will be compared to use of regular trains.

PERFORMING AGENCY: Battelle Memorial Institute/Pacific Northwest Labs, RL 6717A

INVESTIGATOR: Loscutoff, WV (Tel (509) 946-2768) Hall, RJ

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA (Tel (301) 973-5361)

Contract ERDA-AT(45-1)-1830

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$90,000

ACKNOWLEDGMENT: Energy Research and Development Administration

22 138363

**NEW AND IMPROVED SYSTEMS TO HANDLE PEANUTS AT COMMERCIAL STORAGES**

Develop new or improved systems to handle peanuts as they are received, dried, stored, graded, shelled, bagged, and shipped. Presently used systems of handling peanuts will be evaluated for efficiency and cost. Where needed new or improved facility layouts, handling or flow processes, bagging and bulk handling, and sampling methods and equipment will be developed to reduce marketing cost and maintain quality as peanuts move through marketing channels. Field studies made to gather data on labor, methods, and equipment required to containerize and ship shelled peanuts. Bulk containers redesigned or modified to incorporate changes such as closed flute openings and improved sanitation. One type container improved and requires 1.75 minutes to assemble, which is much less than other types. Other studies made to use throw away liners and reuse containers. Other problems such as loading railcars, difficulty in loading space between railcar doors, and container strengths for truck and rail shipments are being studied. A new method of handling bags using portable conveyors from bagging to carrier shows promise of improving present method of bag handling. Experimental unit for automatic bag stacking is almost completed. Analysis of the impact damage data has been completed and a manuscript is being written. Drop height, impact surface, and peanut temperature are significant causes of damage but drop height has most effect.

REFERENCES:

Dimensional Changes in Peanut Pods, Kernels, and Hulls as Moisture is Removed During Curing, Slay, WO, J Amer Peanut Res and Educ Assoc., 1974

PERFORMING AGENCY: Agricultural Research Service, Department of Agriculture, 7704-15700-007  
 INVESTIGATOR: Slay, WO  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 COMPLETION DATE: Nov. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0041935)

**22 138366**  
**INCREASING EFFICIENCY IN THE GRAIN HANDLING STORAGE AND TRANSPORTATION SYSTEM SERVING THE SOUTH PLAINS**

Develop a detailed description of spatial and temporal grain flows and alternative mode freight rates. Determine least-cost grain distribution patterns and most efficient mode use for described grain flow. Estimate least-cost number, size and location of country elevators and feed mills to serve cattle feeding industry. Develop an interregional competition model of feed grain sector with emphasis on South Plains. Via personal interview and main questionnaires of grain handlers, transportation companies and truck brokers existing grain flows and utilized mode freight rates estimated. These data entered into a spatial model to resolve least-cost distribution patterns and modes and then contrasted with actual distribution and utilized modes. Grain elevator, feed mill and transport cost functions and feed grain production data estimated and entered into model to optimize industry organization serving area cattle feeding industry. Spatial analysis of feed grain sector accomplished by estimation of regional demand and supply functions and transport costs which are data inputs for spatial equilibrium model. Operations research procedures necessary for rationalizing a regional grain handling, storage and transportation system are being developed and tested. Several out-of-kilter and implicit enumeration techniques show promise. A main and telephone survey of Texas' grain elevators, feedyards, feedmills, broiler and dairy operations has been completed. The purpose of the survey is to determine structural characteristics of the grain handling industry interstate and interstate grain flows of Texas originated grain, origin of out-of-state produced grain which enters Texas and modes of transportation utilized in alternative grain flows. Analysis of this data will not new commence. These data are being used by the Texas grain dealers association.

**REFERENCES:**

- A Modification of the Modified Stollsteimer Model Fuller, S, Southern Journal of Agricultural Economics, Vol. 7, No. 1, July 1975
- Plant Location Involving a Discontinuous Plant Cost Function Fuller, S, Paper presented at Southern Agricultural Econ Assoc, Feb. 1975
- Optimizing Subindustry Marketing Organization: A Large Scale Fuller, S, Paper presented at American Agricultural Econ Assoc, Aug. 1975

PERFORMING AGENCY: Texas A&M University, Agricultural Economics Department, TEX-6087  
 INVESTIGATOR: Fuller, SW  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1975 COMPLETION DATE: Mar. 1980

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0067558)

**22 138368**  
**IMPROVED HANDLING AND DISTRIBUTION METHODS FOR DOMESTIC MARKETING OF FRUITS AND VEGETABLES**

Find more efficient and effective ways of handling and distributing perishable products from Florida to domestic markets and determine their effects on market quality and consumer preferences. Test and evaluate improved handling methods under simulated and commercial environmental conditions. Develop and test methods for filling, handling, and transporting bulk pallet bins bagged or bulk citrus. Develop and test pallets and/or slip sheets for unitized handling of citrus peppers, and celery from production areas to retail warehouses. Explore possibilities for developing methods whereby railcars can be used more effectively in transporting citrus and winter vegetables from Florida production area.

PERFORMING AGENCY: Department of Agriculture, Horticultural Research Laboratory, 7606-15840-004  
 INVESTIGATOR: Miller, WR Hatton; TT  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1975 COMPLETION DATE: Nov. 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0042873)

**22 138369**  
**COORDINATED MARKETING OF MEAL BY COOPERATIVE SOYBEAN PROCESSING PLANTS**

Describe the geographic market for soybean meal produced by the cooperative soybean processing plants in Iowa and Minnesota. Identify excess movement of product. Report on the savings to individual plants and the cooperatives as a group from more coordination in soybean meal marketing. Collect data on soybean meal sales from cooperative soybean processing plants in Minnesota and Iowa. Map the area served by each plant. Develop and/or collect transportation cost information. Estimate the least-cost movement pattern for supplying meal to customers. Examine and compare product flow and transportation costs.

PERFORMING AGENCY: Department of Agriculture, Farmer Cooperative Service, FCS-1-77

INVESTIGATOR: Powe, CE Miner, BD

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 COMPLETION DATE: Feb. 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0042781)

**22 138375**  
**IMPROVED PACKAGING, HANDLING, AND TRANSPORT OF WESTERN FRUITS AND VEGETABLES**

Improve efficiency of packaging palletization, handling, and transport of western fruits and vegetables to reduce marketing costs and maintain product quality. New packages and methods of palletizing or unitizing these packages will be developed for efficient handling, transport, and marketing of fruits and vegetables. Research will determine package strength, will relate design and loading patterns to cooling rates and transit temperatures, and will correlate packaging, handling, and transport systems to maintenance of product quality. Research will include studies on new packaging and handling systems compatible with mechanical produce and with efficient use of transport vehicles. Lettuce: Hand harvested lettuce packed in 2 doz size cartons had more trim loss (34%) than machine harvested lettuce jumble-filled in bin containers (18 containers (18 percent). A new carton size for lettuce has been developed that can be stacked efficiently on 35 x 42 inch pallets and on 48 x 40 inch pallets, and can dimensions of 20-3/4 inches by 11-1/4 inches by 17 inches. Stone Fruits: Nectarines shipped in a jumble-filled shipped in a jumble-filled 40-pound fiberboard box did not fruit quality from those shipped in the currently used placed-packed fiberboard box or jumble-filled 26-pound wood box. The large 40-pound also performed as well as the standard 26-pound box.

PERFORMING AGENCY: Agricultural Research Service, Department of Agriculture, 5202-15840-001

INVESTIGATOR: Hinsch, RT Rij, RE

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1969 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0020846)

**22 138377**  
**SYSTEMS ANALYSIS OF THE ECONOMICS OF GRAIN MARKETING**

Investigate the operations of marketing systems as they affect: Communications and market information needs and managerial decision-making by

grain marketing firms. Will develop a model to be used to analyze the evaluate and the need and availability of information used in decision-making. Grain firms will be interviewed to identify specific information needs of the grain industry. The catalogue of information obtained will be computerized to aid the analytical process. Will develop decision-making models by adopting the improving existing models or marketing firms will be assembled and evaluated. These data will be assembled and evaluated. These data will be obtained from private and public agencies including EDP companies and trade associations. This project is developing procedures for solving large-scale mathematical models on a regional or national scope. A special transportation-grain flow procedure has been tested with multi-mode transportation areas in Kansas, Nebraska, Colorado, Oklahoma and Texas. Procedures also were developed and tested to evaluate the impact of possible rail abandonment on individual farmers. The procedures performed in an excellent manner.

## REFERENCES:

Effects of Railroad Abandonment on Grain Producers and Grain Elevator Supply Areas in North Central Kansas, Mennem, Kansas State Univ, Agric Econ Dept, PhD Thesis, 1974

The Utilization of Railroad Wheat Cars Owensby, Kansas State Univ, Agric Econ Dept, PhD Thesis, 1974

PERFORMING AGENCY: Kansas State University, Agricultural Economics Department, KAN00827

INVESTIGATOR: Schruben, LW

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0061432)

22 138378

#### FOOD AND FEED GRAINS SUBSECTOR: AN ANALYSIS OF THE DISTRIBUTION AND STORAGE SYSTEM

Identify historic patterns for storing inventories of specific grains, emphasizing year-end stocks. Identify critical economic factors that tend to change location and distribution of storage and year-end stocks. Formulate a model that will simulate the storage system as a part of the grain subsector. Estimate the impact of various market and policy alternatives on the food and feed grains subsector in light of the storage function. U.S.D.A. publications will be searched for data relating to historic storage patterns for grains. Literature will also be searched for economic variables that can be quantified and showed to influence storage patterns. Connect the identify variables in a quantitative system that will simulate the food and feed grains distribution system. Use the model to estimate the impact of changes in policy or the system on related parts of the system.

PERFORMING AGENCY: Georgia Agricultural Experiment Station, Agricultural Economics Department, GEO01185

INVESTIGATOR: Bateman, WL

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0065175)

22 138379

#### SYSTEMS ANALYSIS OF THE ECONOMICS OF GRAIN MARKETING

Determine the effects of changing farm programs on the grain marketing, utilization, and distribution system and investigate the impact these changes will have on the operation of the grain marketing system. A two pronged approach will be used whereby one group will study the impact of changes on the institutional structure of the grain marketing systems from the operational side and the other group will investigate the impact from the policy side. Cause and effect relationships will be determined by each group with the ultimate objective of integrating the results of the two approaches. One aspect is concerned with the effects of railroad abandonment in country elevators and farmers in Ohio. A seven county area will selected in northwest Ohio where data on methods of grain shipments, destinations of shipments, elevator storage capacities, and car siding capacity was obtained for all elevators in the seven counties.

PERFORMING AGENCY: Ohio Agriculture Research and Development Center, Agricultural Economics and Rural Sociology Department, OHO00419

INVESTIGATOR: Sharp, JW

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Current Research Information Service (CRIS-006003)

22 138400

#### REDUCING PHYSICAL AND QUALITY LOSSES OF WHOLE SOYBEANS IN TRANSPORTATION AND HANDLING

The objective is to reduce physical and quality losses, handling and transportation costs for seed, food and processing grade soybeans shipped to domestic and world markets. The type, extent, and causes of physical losses and damage and quality deterioration in the whole beans in the various handling, processing, and transport modes will be identified by shipping and handling surveys and experiments. Alternative handling techniques and improvements in transport and handling equipment and transport and storage environments which may reduce such losses will be identified and developed. This will include single mode and multi-modal transport by truck, railroad, van containers, and barge-ship-barge shipments. These innovations will be evaluated in shipping and handling experiments to develop cost and performance data and appropriate recommendations for improving the handling and transport of the products.

PERFORMING AGENCY: Agricultural Marketing Research Institute, Transportation and Packaging Research Laboratory, ARS 1104

INVESTIGATOR: Nicholas, CJ Bailey, WA

SPONSORING AGENCY: Department of Agriculture, 1104-15881-004

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: Apr. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0043052)

22 138481

#### RAIL WHEAT TRANSPORT EFFICIENCY STUDY

To enhance and improve the physical efficiency of the marketing/transportation distribution system for grains in the hard winter wheat belt moving to domestic or export points, recognizing and utilizing the inherent advantages of rail transportation. Physical distribution study of alternative marketing/transportation systems.

PERFORMING AGENCY: Texas Transportation Institute

INVESTIGATOR: Richards, HA (Tel (713) 749-1579)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Hardesty, F (Tel (202) 426-9682) Boone, JW

Contract DOT-FR-65104

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1976 COMPLETION DATE: Aug. 1978 TOTAL FUNDS: \$630,000

ACKNOWLEDGMENT: FRA

22 148525

#### EFFECTS OF RAILROAD ABANDONMENT ON THE MODAL DISTRIBUTION OF TRAFFIC AND RELATED COSTS

Estimates will be developed of the potential effects of railroad abandonment on: the modal distribution of traffic; increased transportation costs; the number of affected rail users which will close or relocated all or part of an affected facility; resulting capital investment required by affected rail users, transportation companies, and the public sector; and energy consumption. Estimates of the mileage of potentially uneconomic branch lines have been developed and data on the amount of traffic organized and terminated on these lines has been acquired. A survey of 309 potentially affected rail users has been completed. The effects associated with these users have been estimated and are being extrapolated on the basis of four universes of potentially affected shipments.

## REFERENCES:

The Potential for Rail-Service Termination by Non-ConRail Carriers, Weinblatt, H, Nat Symp on Transp for Agric and Rural Am, Nov. 1976

Light Density Railroad Line Abandonment: Scaling the Problem, Matzzie, DE; Weinblatt, H; Harman, J; Jones, JR, Presented at the Transp

## Logistics and Physical Distribution

22A

Res Board Ann Meeting, Jan. 1977

PERFORMING AGENCY: CONSAD Research Corporation

INVESTIGATOR: Weinblatt, H (Tel (412) 363-5500) Matzzie, DE

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Harman, J (Tel (202) 426-4214)

Contract DOT-OS-60154

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec.  
1975 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$119,594

ACKNOWLEDGMENT: CONSAD Research Corporation

23 048959

**CONFERENCE ON THE ADAPTIVE USE OF RAILROAD STATIONS**

The objectives of the symposium are: (1) the establishment of guidelines for the adaptive use of railroad stations; (2) determining whether and what additional Federal, state, or municipal legislation or authority would provide incentives to make adaptive use of stations more attractive to the state, the municipality, the private developer and the local or regional transportation or transit authority; and (3) the establishment of a clearing-house of information on questions relating to the adaptive use of such railroad stations.

The film "STATIONS", 28 minutes, 16 mm, is available on loan from DOT, RM 9422, Tel:(202)426-4298. Film may be purchased from Roger Hagen Associates, 1019 Belmont Place, Seattle, Washington 98102. 28 min Version, \$300.00; rent, \$40. 63 min version, \$600.00; rent \$100.

**REFERENCES:**

Reusing Railroad Stations Vols. I and II, \$4.00 each

PERFORMING AGENCY: National Endowment for the Arts

INVESTIGATOR: Freeland, J

SPONSORING AGENCY: Office of Environment, Safety and Consumer Affairs

RESPONSIBLE INDIVIDUAL: Crecco, RF (Tel (202)426-4298)

IA AS-40066

STATUS: Active NOTICE DATE: July 1976 START DATE: May 1974 TOTAL FUNDS: \$2,000

ACKNOWLEDGMENT: Office of Environment, Safety and Consumer Affairs

23 058364

**REESTABLISHING RAIL SERVICE IN CONJUNCTION WITH NEW FEEDER SYSTEMS**

There is a need in many metropolitan regions, as manifested in northern New Jersey, for a long haul transit and feeder system for a many-to-one and one-to-many distribution. The possibility of utilizing the existing rail right-of-ways, within the framework of federal regulations, to establish a coordinated mass transit system will be determined. Data on population, employment, traffic volume, existing rail right-of-ways and equipment, operating costs, and passenger volume will be collected to formulate and test a demand model with splits for the line-haul system. Alternative feeder systems will be analyzed & a model set up & applied. Institutional and legal restraints will be assessed. Finally, a line-haul network will be conceived that includes the demand model and modal mix, the alternatives and their costs, and the environmental and energy effects, within legal and institutional constraints. The analysis of problems of rededication of underused rail right-of-ways will be conducted with consideration of the Rail Reorg Act. STATUS: Much of the first year efforts were directed toward gathering an adequate data base for the later analysis. Toward this end, rail network descriptions and ridership information were solicited from each of the major commuter rail lines serving northern New Jersey. Two complimentary modelling techniques were developed; a simulation system consisting of routing, demand costing, and operation submodels, and an analytic model consisting of cost and demand elements. Solution of the analytic model in terms of ridership, revenue, and service levels procuded a series of contours through which different alternatives could be evaluated. Supplementary studies of rail abandonment/ restoration strategies were also conducted. The research team evaluated the energy and pollution consequences of abandonment of various rail services in terms of the shifting demand to other modes.

**REFERENCES:**

Analytic Supply Models for Many-to-one Transportation Systems, Orloff, CS; Ma, YY, Aug. 1975

Energy and Pollution Consequences of Abandonment of Various Rail Services within New Jersey, Phillips, JE, Jan. 1975

PERFORMING AGENCY: Princeton University, Department of Civil Engineering

INVESTIGATOR: Lion, PM

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Weil, RW

Contract DOT-OS-40095

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1974 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$297,095

ACKNOWLEDGMENT: TRAIS (PUR-1-40145)

23 058390

**URBAN TRAVEL DEMAND ELASTICITIES STUDY**

Specify and estimate a behavioral travel demand model capable of determining the effects of policy instruments related to pricing, service, and the availability of limited resources, such as parking space and fuel on numbers of urban person trips by mode, purpose and zone. The model will be capable of being easily transformed so as to be applicable to aggregated urban data and to determining the effects of the above policy instruments on lengths of urban person trips. The specific modes will include: 1) Auto 2) Transit and taxi. The purposes will include, but not be limited to: 1) Home-work round trips, 2) Other home-based round trips, 3) Non home-based trips.

PERFORMING AGENCY: Charles River Associates, Incorporated

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, OS-443

RESPONSIBLE INDIVIDUAL: Ward, DE (Tel (617) 494-2512)

Contract TSC-964 (CPFF)

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: Feb. 1975 COMPLETION DATE: Apr. 1976 TOTAL FUNDS: \$64,670

ACKNOWLEDGMENT: TRAIS

23 058440

**DEVELOP AN AGGREGATE MODEL OF URBANIZED AREA TRAVEL BEHAVIOR**

The object of this research is to develop a travel demand model capable of predicting the consequences of alternative transportation actions including investment, operating and pricing changes in the urbanized areas.

**REFERENCES:**

Travel Prediction with Models of Individual Choice Behavior Koppelman, FS, CTS Rept. #75-7, 322 pp, Sept. 1975

Criteria and Issues in the Evaluation of Models for Aggregate Prediction, Koppelman, FS; Roberts, PO, CTS Rept. #75-9, 16 pp, Sept. 1975

Alternate Aggregate Procedures Koppelman, FS, CTS Rept. #75-10, 58 pp, Sept. 1975

Disaggregate Three-Mode Choice Model for Aggregate Forecast Testing, Koppelman, FS; Watanatada, T, CTS Rept. #75-11, 23 pp, Sept. 1975

Develop Alternative Aggregate Models for Testing Purposes & Select Procedure for Use with Trans, Koppelman, FS, CTS Rept. #75-12, 38 pp, Sept. 1975

Trans Model Requirements Watanatada, T; Roberts, PO; Ben-Akiva, ME, CTS Rept. #75-13, 30 pp, Sept. 1975

Evaluation of Disaggregate Data Sets for Use in Phase II Koppelman, FS; Ben-Akiva, ME, CTS Rept. #75-14, 11 pp, Sept. 1975

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies, 82487

INVESTIGATOR: Roberts, PO (Tel (617) 253-7123)

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

RESPONSIBLE INDIVIDUAL:

Contract DOT-OS-50001 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Feb. 1975 TOTAL FUNDS: \$99,695

ACKNOWLEDGMENT: TRAIS, Massachusetts Institute of Technology

23 058544

**DEVELOPMENT OF A DISAGGREGATE BEHAVIORAL DEMAND MODEL**

Special emphasis will be placed on variables which are likely to result in variations in the demand for urban transportation services either in total or among modes, and which are likely to be affected by the response to impending issues, such as air quality strategies, energy shortage, urban congestion or land use policy. Subcases under these broad categories shall include such considerations as auto control strategies (i.e. parking changes, road tolls), variations in fuel costs (including taxations and/or price increases), and improvements in public transportation development. Extension of the model to include carpooling will receive special attention.

PERFORMING AGENCY: Charles River Associates, Incorporated

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

Contract DOT-OS-50161 (CPFF)

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: June 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$78,586

ACKNOWLEDGMENT: TRAIS (OS-40202)

**23 058624**

**STUDY OF SUBWAY STATION DESIGN AND CONSTRUCTION**

The objective is to develop a set of recommended subway station designs for specific urban conditions in order to provide guidelines for more economical subway station construction. The recommended designs will be based on case studies of experience in underground urban rapid transit systems in the United States and in foreign countries. At the conclusion of the study a workshop will be conducted for transit planners, engineers, contractors and operators with the intent of disseminating the information gathered in this study to the tunneling community.

PERFORMING AGENCY: De Leuw, Cather and Company, Incorporated  
 SPONSORING AGENCY: Transportation Systems Center, UM-504  
 RESPONSIBLE INDIVIDUAL: Knoop, P (Tel 617-4942128)

Contract DOT-TSC-1027 (CPFF)

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: June 1975 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$223,838

ACKNOWLEDGMENT: TRAIS (UM-504)

**23 058757**

**METHODOLOGY FOR THE DESIGN OF URBAN TRANSPORTATION INTERFACE FACILITIES**

The purpose of this research is to: 1. develop a set of flexible criteria for the evaluation of alternative station designs, with emphasis on potential implementation constraints and operational efficiency, 2. develop a standard methodology for the design of the layout of urban transportation terminals, 3. apply the methodology developed to a real world situation as a test of the procedures developed, 4. disseminate this methodology to the transit user community for application. STATUS: During the first phase of the research, emphasis was placed on developing a general station design evaluation framework. Functional components of stations, including pedestrian movement facilities, line haul access areas, and communications facilities were identified. A set of generalized terminal evaluation criteria were adopted, and for each criterion, the viewpoint of the user, the special user, and the operator was examined. These criteria include: 1) Passenger Processing Performance; 2) Environmental Conditions; 3) Fiscal Considerations. The level of satisfaction of these criteria is evaluated through the use of an interest impact matrix. Both a cost-benefit (dollar) and subjective index are used in the ranking of design alternatives. A generalized framework for the use of the impact-interest assessment matrix has been advanced and several computer based planning and design methodologies are currently being examined for inclusion into the framework.

REFERENCES:

Criteria for Evaluating Alternative Transit Station Design Hoel, LA; Demetky, MJ; Virkler, MR, Feb. 1976

PERFORMING AGENCY: Virginia University, Department of Civil Engineering

INVESTIGATOR: Hoel, LA Demetsky, MJ

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Paulhus, NG, Jr (Tel 202-4264208)

Contract DOT-OS-50233 (CS)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1975 COMPLETION DATE: May 1978 TOTAL FUNDS: \$126,000

ACKNOWLEDGMENT: TRAIS, OST

**23 058761**

**STUDY TO IDENTIFY THE PROBLEMS THAT DEAF PEOPLE MAY ENCOUNTER WITH METRO AND DIAL-A-BUS IN METROPOLITAN WASHINGTON**

The objectives are: 1. To identify and study the problems that hearing impaired people in the metropolitan Washington, D.C., area encounter or are likely to encounter in attempting to interact with existing Dial-a-Bus transportation services and with subway transportation services when Metro is put into operation. 2. To identify possible alternative solutions to these problems. 3. To project costs of implementing proposed solutions. 4. To

identify potential for transferability of findings to other metropolitan transit systems.

PERFORMING AGENCY: Gallaudet College, Department of Economics  
 INVESTIGATOR: Winauker, I  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Laster, I (Tel (202)426-4380)

Contract DOT-OS-50110 (CS)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1975 TOTAL FUNDS: \$72,040

ACKNOWLEDGMENT: TRAIS, OST

**23 058815**

**CONTINUED SUPPORT BY THE BART IMPACT ADVISORY COMMITTEE**

The BART Impact Program review effort to be conducted by the Advisory Committee is an extension of the provision of advice and assistance to the Departments during the implementation phase of the program. The Committee shall review and provide consultation in all areas of the program to determine what impacts occur, which are attributable to BART, why they occur, and how this information may best be used by the Bay Area as well as by other metropolitan areas contemplating construction of a rapid transit system.

PERFORMING AGENCY: National Academy of Sciences; Department of Housing and Urban Development

SPONSORING AGENCY: Office of the Secretary of Transportation, Department of Transportation; Department of Housing and Urban Development

RESPONSIBLE INDIVIDUAL: Bouchard, RJ

Contract OS-40022/2

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: Oct. 1973 TOTAL FUNDS: \$154,190

ACKNOWLEDGMENT: TRAIS

**23 099391**

**IMPROVED PASSENGER SERVICE PROGRAM**

Provide near and long-term technology to permit maximum effective use of the rail passenger systems. Provide technological data and advice to the Secretary of Transportation for use in his responsibility in connection with Amtrak. Provide support to Amtrak in developing new rail passenger equipment. Provide direct R&D support to Northeast Corridor Project. Formal coordination with Amtrak is being developed. Components on which R&D efforts are directed: Suspension support and guidance; signal, control and communications; braking/adhesion; energy management; propulsion; creature comforts; improved passenger train.

PERFORMING AGENCY: Federal Railroad Administration, Office of Passenger Systems Research and Development

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Mitchell, MB (Tel 202-426-0966)

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: 1966

ACKNOWLEDGMENT: FRA

**23 099416**

**STUDY OF TRANSIT FARE POLICIES AND IMPLICATIONS**

This project will develop information on transit fares and fare structures that can (1) identify promising techniques for increasing ridership, (2) assess effects of fare policies on operations, (3) instruct public policy regarding transit pricing, and (4) guide management decision-making by transit properties with regard to fare policies. Attention will be given to existing pricing policies in urban transit, alternative fare structures and packaging techniques, (including the extent of no-fare transit operations), the potential for fare modification as a marketing tool, the effects of alternative fare and service packages on transit ridership and revenue (i.e., the price elasticity of transit demand), the institutional constraints affecting fare and service change, the implications for public policy, and the need for further research. In addition to a final report covering all data, analysis, methodology, findings and recommendations, a Transit Pricing Manual will be prepared for transit operators and other interested public agencies responsible for transit operations.



PERFORMING AGENCY: Peat, Marwick, Mitchell and Company  
 SPONSORING AGENCY: Urban Mass Transportation Administration

Contract IT-06-0095

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: Sept. 1974  
 COMPLETION DATE: June 1976 TOTAL FUNDS: \$120,000

ACKNOWLEDGMENT: UMTA

23 129702

**PASSENGER SERVICE ANALYSIS**

This program involves a study to determine criteria for establishment of rail-bus through rates and routes in specific areas. Such integration will provide service to areas lacking passenger rail facilities. The program provides input into the proper role of rail in overall passenger transportation policy.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development  
 RESPONSIBLE INDIVIDUAL: Cantey, W

STATUS: Proposed NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

23 136343

**TECHNOLOGY ASSESSMENT OF INTERCITY TRANSPORTATION SYSTEMS**

The objectives of this RTOP are to enhance NASA's contribution to our nation's ability to provide adequately for its future transportation needs, including model systems and their energy requirements; and to determine the possible impacts on the timeframe and goals of aviation and air transportation R&T of the more promising future intercity transportation systems and corresponding urban structures. The approach will be based on extending the NASA/DOT joint agency Technology Assessment of Intercity Transportation Systems into Phase 2 activities. Phase 2 shall include the selection of initiation of follow-on studies of critical issues, constraints, barriers (identified in the Phase 1 technology assessment) which require further definition toward future objectives of the NASA aeronautics program. The follow-on activities emanating from Phase 1 which are of mutual interest to both NASA and DOT will be jointly funded by the two agencies, and those tasks of sole interest to each agency will be independently funded.

PERFORMING AGENCY: National Aeronautics and Space Administration, Ames Research Center  
 INVESTIGATOR: Hornby, H  
 SPONSORING AGENCY: National Aeronautics and Space Administration, Aeronautics and Space Technology Office, 791-40 7670169

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZH 40922 2)

23 138473

**PASSENGER RAIL SERVICE AND THE HIERARCHY OF COMMUNICATIONS EFFECTS**

Objective is to appraise the effects of a change in passenger rail service and its attendant promotion upon the awareness, attitudes, and intentions of certain rail users in an urban market for intercity passenger service. A three-wave telephone survey of three segments of potential users obtains measures of awareness, attitudes, and intentions before and after a service change. Statistical analysis will probe the relationships between these measures, and also relate them to advertising and to ticket sales.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
 INVESTIGATOR: Turner, RE  
 SPONSORING AGENCY: Canadian National Railways

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976  
 COMPLETION DATE: Dec. 1976

ACKNOWLEDGMENT: CIGGT

23 138794

**A STUDY OF EXISTING RIGHTS OF WAY FOR INTERMEDIATE CAPACITY TRANSIT APPLICATION IN CANADIAN CITIES**

The extreme cost and community disruption associated with acquiring rights of way for new urban transportation systems, coupled with the increasing need to separate surface transit from the general traffic stream, has produced increased interest in making more efficient utilization of existing surface transportation rights of way, particularly the urban rail systems. This study examines the correspondence of existing rail lines in Canada's largest cities with major desire lines of travel and estimates for intermediate capacity transit systems operating along these lines in 1985.

PERFORMING AGENCY: De Leuw Cather Canada Limited  
 INVESTIGATOR: McCorquodale, D (Tel (613) 733-4160)  
 SPONSORING AGENCY: Transportation Development Agency; Canadian Transport Commission; Ministry of State for Urban Affairs  
 RESPONSIBLE INDIVIDUAL: McCoombs, LA (Tel (514) 283-3210)

STATUS: Active NOTICE DATE: July 1976 COMPLETION DATE: Aug. 1976  
 TOTAL FUNDS: \$100,000

ACKNOWLEDGMENT: Transportation Development Agency

23 138795

**AN EVALUATION OF URBAN RAIL FACILITIES**

The extreme cost and community disruption associated with acquiring rights of way for new urban transportation systems, coupled with the increasing need to separate surface transit from the general traffic stream, has produced increased interest in making more efficient utilization of existing surface transportation rights of way, particularly the urban rail systems. This study examines the urban rail lines in Canada's 12 largest cities; excluding Toronto, in terms of their physical characteristics (rights of way, obstacles, geometrics, etc.) and operational characteristics (train movements, level crossings, signal systems, etc.) as these might affect the use of these rights of way for public transit use.

PERFORMING AGENCY: Canadian Pacific Consulting Services Limited  
 INVESTIGATOR: Stavrou, G (Tel (303) 861-6811)  
 SPONSORING AGENCY: Transportation Development Agency  
 RESPONSIBLE INDIVIDUAL: McCoombs, LA (Tel (514) 283-3210)

STATUS: Active NOTICE DATE: July 1976 START DATE: Oct. 1975  
 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$150,000

ACKNOWLEDGMENT: Transportation Development Agency

23 141170

**RESEARCH INITIATION-URBAN STRUCTURE AND TRANSPORTATION REQUIREMENTS**

This research project is to explore in detail the interrelationships among needs and desires for certain urban activities, urban structures designed to satisfy these needs, and the corresponding transportation requirements. Special attention will be focused on residential and employment activities. In particular, choices of household location and employment locations will be examined. It is hypothesized that these mobility choices will have influence on the transportation requirements for urban areas over and above that of the physical structure of the area. In this way, this approach differs from most previous approaches which treat residential and employment locations statically. It is expected that the better understanding of these interrelationships will lead to reduced travel in urban areas, but will also reveal the importance of the mobility choices and the activity choices of urban residents.

PERFORMING AGENCY: California University, Davis, School of Engineering  
 INVESTIGATOR: Tardiff, TJ  
 SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG76-09608

STATUS: Active NOTICE DATE: June 1976 START DATE: Mar. 1976  
 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$20,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5776)

23 148806

**NORTHWEST INDIANA CORRIDOR STUDY**

With Chicago South Shore and South Bend Railroad having filed to abandon passenger service between Chicago and South Bend, Indiana, the state has requested recommendations for transportation services to meet residents' needs. If continued rail service is recommended, the state will take steps to aid local governments in financing the operation. Alternatives of express bus service, reduced CCS&SB service, continuation of present level of CSS&SB service and even expanded rail service are to be examined. Aside from financial cost and benefits, social benefits involving energy, pollution, congestion and recreation will be evaluated.

Co-sponsors of this project are Northwestern Indiana Regional Planning Commission and the Michigan Area Council of Governments.

PERFORMING AGENCY: Indiana University, Bloomington, Institute for Urban Transport

SPONSORING AGENCY: Northwest Indiana Public Transportation Authority

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1976 COMPLETION DATE: 1977 TOTAL FUNDS: \$65,000

ACKNOWLEDGMENT: Indiana University, Bloomington

24 099383

**RAIL INDUSTRY PROBLEMS PROGRAM**

This program presently involves seven phases: (1) Cost Analysis of roadway maintenance, of operation and maintenance of cars and motive power, of yard operation, of communication and of various phases of traffic handling and operations; (2) Commodity Service involving perishable goods, Iowa Rail Plan analysis, coal transport efficiency, wheat gathering analysis; (3) Carrier Financial Analysis including modification of financial forecasting model, data base retrieval and standardization, return-on-investment analysis, government subsidy study, and studies of cost of capital and of financing; (4) Improved Use of Assets involving experiments with work rules agreements, worker training, strike impact analysis economic analysis of rail labor factors, and improvement in employee communications; (5) Waybill Analysis involving process of waybills to build data base, automation of commodity management, and evaluation of sampling and analytical techniques; (6) Railroad Network Model to include building of national network model with geographical backup and expansion of network information base; (7) Nationwide Rail Passenger Data Collection System.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Systems Analysis and Program Development

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: De Boer, DJ (Tel 202-426-9682)

STATUS: Active NOTICE DATE: Aug. 1975

ACKNOWLEDGMENT: FRA

24 099402

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM, PHASE I. TASK 5--IMPACT OF AAR AND ICC RULES, DIRECTIVES AND ORDERS ON CAR UTILIZATION**

Continue the evaluation of activity currently supporting the Clearinghouse experiment. This evaluation will include utilization comparisons of Railbox with comparable railroad-owned car groups. Assist in revising the Clearinghouse ground rules to improve the efficiency of the Clearinghouse alternative to Car Service Rules 1 and 2. Attempt to set up demonstrations to evaluate alternatives to industry rules and practices in the areas of per diem, demurrage and car service rules and orders.

For further information on related studies see also RRIS 099398 Section 26A, 099399 17A, 099400 17A, 099401 17A, 099403 21A.

PERFORMING AGENCY: Association of American Railroads

INVESTIGATOR: Metz, HW (Tel 312-435-7327)

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Leilich, GM (Tel 202-293-5018)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975 COMPLETION DATE: July 1977

ACKNOWLEDGMENT: AAR

24 129703

**FREIGHT CAR MANAGEMENT SYSTEMS ANALYSIS**

These analyses are designed to solve problems using short-term, conventional strategies. The program provides for analysis of railroad operations management, problem definition, and research into short-run policy alternatives and strategies for improvement that can be implemented using existing management capabilities.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development

RESPONSIBLE INDIVIDUAL: Cantey, W

STATUS: Proposed NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

24 129733

**EMPLOYEE-MANAGER COMMUNICATIONS IMPROVEMENT**

Improve the communication between employees and management. Sponsor conferences which bring both parties together to discuss selected items such as alcoholism, safety, uniform rule books, etc. through a survey of methods adopted in other industries and by employee questionnaires, prepare documentation on practical methods, etc., railroad industry can adopt to improve communications between employees and management.

## REFERENCES:

Proceedings 1975--Conf on the Detection, Prevention and Rehab of the Problem Drinking Employee in the RR Industry, Cornell University, Jan. 1976, PB-248906

Conf. Proc. Employee Assistance Programs - An Alternative to Tragedy; Carson Inn Proj. ie Milwaukee Proj, Lab/Mgt Wrkshp, Proceedings 76, 1976

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development

RESPONSIBLE INDIVIDUAL: Collins, DM (Tel (202)426-2608)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975

ACKNOWLEDGMENT: FRA

24 129734

**STRIKE IMPACT MODEL ANALYSIS**

To evaluate the ramifications of a strike by workers against a railroad or related industry and to further develop and refine a model used to analyze the impact on railroads of a strike action against companies or industries on which the railroads are heavily dependent for revenue.

## REFERENCES:

Analytical Model and Simulation to Assess the Impacts of Labor Strikes

PERFORMING AGENCY: Gellman Research Associates, Incorporated

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development

RESPONSIBLE INDIVIDUAL: Vass, T (Tel (202)426-2608)

Contract DOT-FR-65090

STATUS: Completed NOTICE DATE: Feb. 1977 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$113,510

ACKNOWLEDGMENT: FRA

24 138479

**ANALYSIS OF THE ACQUISITION OF A BANKRUPT RAILROAD BY A SOLVENT RAILROAD**

Analyze the impact of the acquisition of a marginal railroad by a connecting solvent to determine the impact of the transfer upon the service and economic elements in the post acquisition period.

Sponsored by the Office of Rail Economics and Policy Development of FRA.

PERFORMING AGENCY: Gellman Research Associates, Incorporated

INVESTIGATOR: Strock, J (Tel (215) 884-7500)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Anderson, EW (Tel (202)426-0771)

Contract DOT-FR-65149

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: Oct. 1975 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$10,000

ACKNOWLEDGMENT: FRA

24 138503

**CLASSIFICATION AND DESIGNATION OF RAIL LINES**

On August 3, 1976, the Railroad Revitalization and Regulatory Reform Act of 1976 required the Secretary of Transportation to develop and publish: 1. The preliminary standards for classification of main and branchlines according to the degree to which they are essential to the rail transportation system. 2. The preliminary designations with respect to each main and branchline in accordance with the classification standards.

PERFORMING AGENCY: Federal Railroad Administration, Department of Transportation

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Newkirk, JL (Tel (202) 426-0771)

STATUS: Active NOTICE DATE: July 1976 START DATE: Feb. 1976 COMPLETION DATE: Aug. 1976

ACKNOWLEDGMENT: FRA

24 141169

**RESEARCH INITIATION-CHOICE THEORY MODEL OF URBAN TRANSPORTATION SYSTEMS**

This research project will develop choice theory models of urban residential location decisions. These models will explicitly incorporate the simultaneity inherent in location, housing, automobile ownership and mode to work choices, and therefore reflect the most important impacts of alternative transportation engineering designs. Variables used in the models will include measures of the transportation level of service to work, neighborhood characteristics, housing attributes, auto ownership attributes, the accessibility of alternative locations to non-work opportunities, etc. Both the models will use the data from the 1968 Washington, D.C. home interview survey, supplemented with 1970 U.S. census data. Validation tests will be performed on the final models and the effect of a range of alternative transportation system designs will be evaluated.

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Lerman, SR

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG76-09431

STATUS: Active NOTICE DATE: June 1976 START DATE: Mar. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$20,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5765)

24 144358

**A STUDY OF FREIGHT COMMODITY TRANSPORT REQUIREMENTS IN THE REPUBLIC OF COLOMBIA**

Research is focused on the long-term role of the National Railways of Colombia vis-a-vis alternative transport modes in the haulage of major commodities, in the context of alternative scenarios for rationalization and improvement of the railroad's operations and levels of service. This is a collaborative research project involving the Adaptation of Industrial and Public Works Technology to the Conditions of Developing Countries (TAP) at MIT and the Faculty of the Universidad de los Andes in Bogota, Colombia. TAP's contribution is to apply appropriate techniques and procedures devised by the Transportation Systems Division of MIT's Department of Civil Engineering in its studies of U.S. railroad operations and economics to the Colombian Transportation Network. Part 3 of 7.

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Sussman, J Sloss, J

SPONSORING AGENCY: Department of State, Agency for International Development, USAID/ESD-3360

Contract

STATUS: Active NOTICE DATE: June 1976 START DATE: Sept. 1975 COMPLETION DATE: Aug. 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GI 473)

24 148326

**METHODOLOGIES FOR DEVELOPING AND EVALUATING EFFECTIVE RAILROAD NETWORKS**

The U. S. rail system exhibits redundancies and misallocations that adversely affect the costs and performance of the rail system and of the U. S. economy. The system exhibits many low density branch lines, duplicate main lines, redundant terminal facilities, obsolete technologies and low service levels. The research has developed methodologies and models to aid

in the prediction of the effect of railroad rationalization proposals. Within this framework, innovative modelling techniques have been constructed to aid in quantifying the operational and economic consequences of rationalization alternatives. Recognizing that there are more alternatives for improving rail performance than could be reasonably analyzed, screening models were developed and validated. Models of rail trip time, reliability, freight car requirements and locomotive requirements were also constructed and used to provide quick estimates of rationalization impacts. Simulation techniques patterned after the Forrester dynamics model illustrate the dynamic effects of alternative industry expenditure and investment patterns. Efforts have been made to identify the major types of alternatives available for rail system improvement and the kinds of impacts that they are likely to have on affected groups and organizations. The developed methodology includes guidelines for rail planning and a discussion of the usefulness of models in this process.

Drawing on new techniques in disaggregate travel demand modelling, the research team has completed to pilot freight demand model. Given further development, such freight flow models would be of great use to planners, policymakers and shippers. MIT's investigation into the history of rail abandonments has already been useful in the U.S. Department of Transportation's preparation of legislation. Many state and local agencies, as well as the ICC, have expressed interest in the project. MIT has used its methodology in an evaluation of the USRA Preliminary and Final System Plans. MIT has also applied many of the analytic techniques in search conducted for the Freight Car Utilization Program, which is supported by the AAR, the federal government, and railroad shippers.

REFERENCES:

An Analysis and Evaluation of Past Experience in Rationalizing Railroad Networks, Sloss; Humphrey; Krutter, Feb. 1975

Framework for Predicting External Impacts of Railroad Abandonment, Humphrey, Feb. 1975

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Sussman, J

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Newkirk, JL

Contract DOT-OS-40002

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$260,000

ACKNOWLEDGMENT: DOT

24 148339

**MILWAUKEE PROJECT-LOCAL LEVEL LABOR-MANAGEMENT WORKSHOP**

To develop and promote more open and effective Labor- Management communications, primarily at the local level. Intensive professional discussions are held in relation to job accountabilities and responsibilities, factors of railroad productivity, and the future of the industry. Professionally conducted group interaction sessions will give the participants the human relations tools needed to actively pursue constructive Labor-Management relations in their respective territories.

PERFORMING AGENCY: Chicago, Milwaukee, St. Paul and Pacific Railroad

INVESTIGATOR: Gardner, B

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development

RESPONSIBLE INDIVIDUAL: Collins, DM (Tel (202)426-2608)

Contract DOT-FR-T5192

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1976 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$22,000

ACKNOWLEDGMENT: FRA

25 058293

**TRANSPORTATION INVESTMENT REQUIREMENTS AND GROWTH IN MICHIGAN**

The present research project has developed a multimodal supply equilibrium model capable of determining the transportation investment required for various population distributions for Michigan. The research objectives are achieved by a solution of both an economic growth allocation model and a transport supply model. The transport supply model uses the results of the economic growth model to determine the investment required to maintain a specified level of service. With this interaction, postulated zonal growth patterns at the SMSA level may be investigated by determining the level of the transportation supply parameters required to meet this growth. During the second year of this effort, the model was used for the evaluation of alternate demographic patterns. Particular emphasis was placed upon identifying the impacts of selected investment on both transport flow and land use patterns. Finally, the research will evaluate the usefulness of the modeling framework through a series of seminars and discussions designed to utilize the planning experience of land use and transportation plans.

PERFORMING AGENCY: Michigan State University, East Lansing, Department of Civil Engineering  
 INVESTIGATOR: Taylor, WC (Tel (517) 353-7224) McKelvey, FX  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Winestone, RL

Contract DOT-OS-50044

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1975 TOTAL FUNDS: \$73,680

ACKNOWLEDGMENT: TRAIS, Michigan State University, East Lansing

25 058351

**ANALYSIS OF A STATE-WIDE INTEGRATED TRANSPORTATION SYSTEM**

Tasks include: 1) Analysis of current status and changing character of transportation modes in Mississippi. 2) Analysis of population characteristics and availability of population to transportation modes. 3) Examine the relationship between the transportation system and views of users and nonusers. 4) Analyze the flow of commodities within and through the state. 5) Analyze present transportation planning processes and develop procedures for implementing new planning processes.

PERFORMING AGENCY: University of Southern Mississippi; Mississippi Research and Development Center; Jackson State University; Mississippi State University; Mississippi University  
 INVESTIGATOR: Peterson, JR Mississippi Research and Development Center Benjamin, R Jackson State University Smith, R Jackson State University DeLeeuw, SL Mississippi University Hearn, H Mississippi University McArthur, RE Mississippi University Crosslin, RL Mississippi State University Rush, JW Mississippi State University Peden, GT, Jr Mississippi State University Gladden, JW, Jr University of Southern Mississippi McKee, JO University of Southern Mississippi Mealor, WT, Jr University of Southern Mississippi  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: MacRae, NK (Tel (202) 426-9561)

Contract DOT-OS-40089

STATUS: Active NOTICE DATE: July 1976 START DATE: Jan. 1974 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$195,000

ACKNOWLEDGMENT: TRAIS, Mississippi University

25 058490

**TRANSPORTATION ENERGY CONSUMPTION AND URBAN FORM RELATIONSHIP**

Specific objectives are: a. Develop an analytical tool capable of assessing the relationship between urban land form and energy consumed to satisfy travel requirements. b. Establish the validity of the analytical tool. c. Utilizing the analytical tool, examine the relationship between urban land form and energy consumption for a number of abstracted existing land use patterns as well as a number of proposed or hypothetical land use patterns. d. Identify the policy options that may be realistically implemented to affect land use and the transportation system. e. Explore the impacts of implementing the different policy options and identify their effect on energy consumption.

PERFORMING AGENCY: Northwestern University, Evanston  
 INVESTIGATOR: Schofer, JL  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Swerdloff, CN (Tel (202)426-4163)

Contract DOT-OS-50118 (CS)

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1975 COMPLETION DATE: July 1976 TOTAL FUNDS: \$89,800

ACKNOWLEDGMENT: TRAIS (PUR-50032), OST

25 058507

**DEVELOPING LOCAL STRATEGIES AS ALTERNATIVES TO ABANDONMENT OF LIGHT DENSITY RAILROAD LINES**

It is estimated that one-third of the U.S. railroad track system is redundant and/or unprofitable due to intense intermodal competition and rising costs. Abandonment of rail lines can be harmful to communities previously served; however, the bankrupt conditions of many railroads makes cross-subsidization of unprofitable freight lines no longer possible. The project is to develop a handbook to assist shippers, local and state governmental units, and planners in their efforts to preserve adequate rail service or to ease the transition to alternative transportation services on a long-run, sound financial basis. Federal and state abandonment laws will be surveyed and innovations for preserving rail service or starting new transportation services will be identified and described. Methods for a smooth and orderly transition will be stressed. The advantages, disadvantages, barriers, constraints, issues, and impacts of implementing the innovations will be analyzed and evaluated with respect to safety, economics, taxes, environmental, etc., considerations. A methodology for evaluating and ranking the alternative courses of action by order of priority is to be developed. STATUS: The research is formally being conducted in four states: 1) identification of data needs; 2) data collection 3) data analysis, and 4) preparation of the handbook. All of the above tasks have been completed to date. In addition, a technical report has been prepared which documents the research methodology used for all states of the research, including preparation of the Handbook.

## REFERENCES:

Local Participation: The Key to Preserving Adequate Railroad Service, Davis, FW, Jr; Patton, EP; Tuttle, RE, Jr, MSU Business Topics, V24, N1, pp 40-46, Dec. 1976

Alternatives to Abandonment Langley, CJ, Jr; Patton, EP; Distribution Worldwide, V75, N4, pp 35-37, Apr. 1976

Alternative Strategies to Railroad Abandonment Patton, EP; Langley, CJ, Jr; Tuttle, RE, Tennessee University, Transportation Center, Workign Pap. TC 76-013, 76

PERFORMING AGENCY: Tennessee University, College of Business Administration, 142510/6297 R95  
 INVESTIGATOR: Patton, EP (Tel (615) 974-5311)  
 SPONSORING AGENCY: Office of University Research, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Murphy, T (Tel (202) 426-4416)

Contract DOT-OS-50125 (CS)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 TOTAL FUNDS: \$85,420

ACKNOWLEDGMENT: Tennessee University, Knoxville (PUR-50164)

25 058699

**DEVELOPMENT OF A REPORT ON RAILROAD RESEARCH NEEDS**

To provide input for this report, the Transportation Research Board will organize a railroad research conference in which qualified persons from the railroad and associated communities will participate. The conference will review the needs for railroad research, will review current and recent efforts in railroad research, and will define needed railroad research for the next five to ten years.

PERFORMING AGENCY: National Academy Of Sciences, Transportation Research Board  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation; Association of American Railroads  
 RESPONSIBLE INDIVIDUAL: Ahmed, N Way, G

Contract DOT-OS-40022/23

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$100,000

ACKNOWLEDGMENT: TRAIS

25 058753

**SCENARIOS FOR ALTERNATIVE ROLES OF THE FEDERAL GOVERNMENT IN TRANSPORTATION**

The research has produced results in several areas. Initially, an evaluation of government policies in order to identify the major areas of policy concern. Simultaneously, an analysis of the various performance measures in the respective industries was conducted, yielding areas where additional parameters of transport efficiency needed. Distinct analytical methodologies have been developed to: 1) Estimate multi-product cost functions in the transport industries. Such general functions can be used to determine long-run, short-run, and marginal cost functions. 2) Evaluate the impact on transport industries of government policy changes in the areas of rate deregulation, elimination of union work rules, free market entry, and new investment or government subsidy. 3) Link the intercity freight industries to the national economy in such a way that inter-industry and interregional impacts may be measured.

REFERENCES:

Air Transport in a New Regulatory Environment Simpson, RW, Airline Deregulation Conf. Northwestern Univ., 1976

Alternative Forms of Deregulation of the Trucking Industry Sloss, J, Transp Res Forum, Toronto, Canada, Nov. 1975

Deregulation: It Wows Them in Washington, But its a Wipe-out in Wolf Point, Vittek, FJ, Airline Deregulation Conf, Northwestern Unive, Mar. 1976

PERFORMING AGENCY: Massachusetts Institute of Technology

INVESTIGATOR: Friedlaender, AF Simpson, RW

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Nupp, B (Tel 202-4264447)

Contract DOT-OS-50239

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$400,000

ACKNOWLEDGMENT: TRAIS

25 099365

**VALUE CAPTURE POLICY**

This research explores legal, financial and community design issues resulting from the introduction of mass transit station facilities in a community. Collectively termed "Value Captive", these efforts are becoming increasingly important in the evaluation of transit projects. First year efforts developed major concepts and defined and analyzed the critical issues in the three concern areas using Houston, Texas as an example city. Year two took Value Capture and applied it to proposed transit improvements in Los Angeles, Louisville, Kentucky and Chicago. Problems and opportunities for the application of Value Capture techniques by one or more types of public administrative agencies were identified. This included an examination and comparison of significant legal barriers, economic issues, investment opportunities, sources and restrictions on funds, and potential community impacts related to hypothetical examples of transit stop related development. The research teams worked closely with the municipalities involved and the Urban Mass Transit Administration. STATUS: Results from the first year of research detailing the legal, financial and community implications of Value Capture have been published and widely distributed. Second year research has focused on three cities: Los Angeles, Louisville, and Chicago. In each case, prospects for applying Value Capture to proposed mass transit development have been thoroughly evaluated. It was found that there is significant potential for the beneficial application of Value Capture, although the most appropriate techniques for applying it are not the same in each city. In application situations in this work, potential fiscal returns were found to be widely varying depending upon the community under examination, Value Capture techniques used, and the legal basis for their application. In all, it may be summarized that Value Capture's potential success is closely related to the success of the mass transit system itself. Good transit planning will definitely support the success of Value Capture but not insure it.

REFERENCES:

Value Capture Policy. 4 Vols. Introduction, Legal Element Financial

Element, and Community Enhancement, DOT Publication, DOT-TST-75-85, Nov. 1974

Value Capture and Joint Development Applications Dec. 1975

How to Make Mass Transit Pay its own Fare Design and Environment Magazine, Apr. 1975

Value Capture Policy Planning Mag, Am Soc of Planning Officials, Apr. 1976

Joint Land Use and Transportation Development-Application of the Value Capture Concept, Transportation Research Board, NAS, Jan. 1975

Planning, Financing and Implementing JOint Development A National Transit Symposium, Miami, FLA., Jan. 1975

PERFORMING AGENCY: Rice University, School of Architecture

INVESTIGATOR: Sharpe, CP

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Nupp, B

Contract DOT-OS-40007

STATUS: Active NOTICE DATE: Feb. 1977 COMPLETION DATE: Dec. 1976 TOTAL FUNDS: \$175,000

ACKNOWLEDGMENT: DOT

25 128851

**TEXAS RAIL SYSTEM EVALUATION**

The major purpose of this study is to evaluate the Rail System Serving Texas and identify the operating and institutional constraints under which it functions. The study will evaluate the railroads serving Texas and recommend policies and actions which are necessary for the continued financial validity of these private carriers. In addition, the study will investigate the feasibility of increasing rail passenger service within Texas. Primary areas of investigation include transportation user's perception of rail service in Texas, Financial status of carriers in Texas, economic regulation review, rail system descriptions, rail labor, rail safety, grade crossings, state-local taxation of rail properties, energy pollution characteristics review.

REFERENCES:

History of Rail Passenger Service in Texas 1820-1970

The Technology of Rail Passenger Service

Amtrak: Its Texas Operations

An Evaluation of Intercity Travel in Major Texan Corridors

Financial Overview of Railroad Companies Operating in Texas

Railroad Employment Analysis

A Survey of Transportation User's Attitudes and Perceptions of Rail Service in Texas

PERFORMING AGENCY: Texas Transportation Institute, Texas A&M University

INVESTIGATOR: Richards, HA (Tel (713)845-1717) Sammon, IP

SPONSORING AGENCY: Texas State Government

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: Texas Transportation Institute

25 128852

**PRODUCTIVITY IN TRANSPORTATION AND PIECEMEAL DEREGULATION OF THE INDUSTRY**

The position taken in this proposal is that technological and other changes have significantly altered the competitive situation in transportation. These changes raise the possibility of increasing productivity in transportation by returning to market forces at least partial responsibility for determining prices and outputs. Our specific area of interest is the exempt agricultural commodities. The research will provide useful results on the effects of extending these regulatory exemptions to railroads, including effects on energy consumption, car utilization, and other aspects of productivity. The research will examine the implications of deregulation on the future functioning of railroad rate bureaus and investigate the effects of user charges and subsidies on intermodel competition. A major benefit of the research will be a usable methodology for examining partial deregulation questions. The methodology will consist of a quantitative model of intermodal freight competition and a "users manual". The users' manual will consist of a series of model applications, representing the range of alternative regulatory instruments from direct regulation to subsidies and taxes. We will also publish the methodology and the results as articles in both professional and trade journals. Testimony will be presented to the appropriate committees of Congress.

PERFORMING AGENCY: Northwestern University, Evanston, Transportation Center  
 INVESTIGATOR: Moses, LN  
 SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$110,000

ACKNOWLEDGMENT: Northwestern University, Evanston, Smithsonian Science Information Exchange (GSQ 1407)

25 129736

**RAIL LINE ABANDONMENT-CURTAILMENT AND RURAL DEVELOPMENT**

To assist State Governments in establishment and determination of state rail transportation planning and decision making. The project report emphasizes the options and alternate strategies open to state government when faced with rural rail abandonments or rail service curtailment. The impacts on rural communities and their future development are also investigated.

REFERENCES:

The Northeast and Midwest Rail Crisis: A Bibliography of Current Literature, Black, WR; Runke, JF, Aug. 1975

The States and Rural Rail Preservation: Alternative Strategies, Black, WR; Runke, JF, Jan. 1975

PERFORMING AGENCY: Council of State Governments  
 INVESTIGATOR: Runke, JF (Tel 606-252-2291) Black, WR  
 SPONSORING AGENCY: Department of Commerce  
 RESPONSIBLE INDIVIDUAL: Rendahl, R (Tel 202-967-2816)

Contract 99-6-9383

STATUS: Active NOTICE DATE: Feb. 1976 START DATE: Nov. 1974 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$167,000

ACKNOWLEDGMENT: Department of Commerce

25 129737

**URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES-RD&D NEEDS DETERMINATION**

Public Technology, Inc. serves as secretariat for the Urban Consortium for Technology Initiatives, a body composed of the 27 largest cities (in population) and 6 large urban counties. Under this project, the Consortium members are developing a prioritized list of problem areas in large cities which might be addressed by research or research utilization activities in the Federal Government or the private sector.

PERFORMING AGENCY: Public Technology, Incorporated  
 INVESTIGATOR: Burke, A (Tel (202)452-7789)  
 SPONSORING AGENCY: Department of Transportation, Office of Systems Development and Technology  
 RESPONSIBLE INDIVIDUAL: Linhares, AB (Tel 202-426-4208)

Contract DOT-AS-40063

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: May 1974 TOTAL FUNDS: \$50,000

ACKNOWLEDGMENT: DOT

25 129738

**URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES-TRANSPORTATION NEEDS ANALYSIS AND INFORMATION PACKAGE DEVELOPMENT**

Based on previous needs assessment work the Consortium will conduct an analysis of the transportation-related needs, attempting to determine those for which technological solutions have been developed and need only to be applied, and those for which research is necessary. Project specifications and technical information packages will then be developed, based on these analyses.

PERFORMING AGENCY: Public Technology, Incorporated  
 INVESTIGATOR: Burke, A (Tel (202)452-7789)  
 SPONSORING AGENCY: Department of Transportation, Office of Systems Development and Technology; Federal Highway Administration; Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Linhares, AB (Tel 202-426-4208)

Contract DOT-OS-60076

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$300,000

ACKNOWLEDGMENT: DOT

25 129741

**EVALUATION OF GOVERNMENT TRANSPORTATION SUBSIDIES**

Develop a set of methodologies and procedures to analyze and evaluate transportation subsidy programs.

PERFORMING AGENCY: International Business Services, Incorporated  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Lawler, JD (Tel 202-426-0771)

Contract DOT-FR-65118

STATUS: Active NOTICE DATE: July 1976 START DATE: Apr. 1976 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$150,000

ACKNOWLEDGMENT: FRA

25 130497

**SECONDARY IMPACTS OF ESTABLISHING A CORE RAILROAD SYSTEM- RAIL ABANDONMENT AND PROPERTY TAXES**

The study will examine the secondary effects of ownership or abandonment of rail-right-of-way, primarily in the Northeastern and Mid-western regions of the U.S. covered the Railway Reorganization Act of 1974 with some study in other areas. The study is divided into three parts (1) examining the impact of tax loss upon state and local government as a result of government ownership or abandonment of railroad beds; (2) determining the pattern and extent of property taxation of railroad beds; (3) identifying the extent of other secondary effects of rail abandonment, particularly the inequitable tax of railroads as compared to other modes of transportation.

PERFORMING AGENCY: State University of New York, Binghamton, Graduate School

INVESTIGATOR: Chinitz, B Thompson, DL  
 SPONSORING AGENCY: National Science Foundation, Office of Science and Technology Policy, STP75-22353

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: June 1975 COMPLETION DATE: May 1976 TOTAL FUNDS: \$50,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BK 689)

25 135115

**FREIGHT DATA REQUIREMENTS FOR STATEWIDE TRANSPORTATION SYSTEMS PLANNING**

The general objective of this research is first to determine the type, amount, and relative importance of freight data required to develop statewide transportation system plans; and, second, to design and develop techniques, methods, and procedures for assembling these data. This research is being conducted in two phases. Many state departments of transportation (and other state and regional agencies) are now concerned with preparing, or assisting in the preparation of, statewide "master plans" for highway, rail, air, pipeline, and water facilities needed to serve existing and future freight flows. Because this is a relatively new focus, the DOTs often are not familiar with the kinds of freight data needed for such planning. Furthermore, little is known about currently available data, its reliability, its compatibility among different sources, its temporal continuity, its units of aggregation, its costs, and so forth. Such data are believed to be necessary to the planning processes. There is a need to define and rank essential data and to begin building a core of knowledge and understanding about goods transport, especially the identification of existing freight data source material upon which future transportation plans can be based. Also, there is a need to develop methods for assembling basic freight data.

Research in Progress.

PERFORMING AGENCY: Creighton (Roger) Associates, Incorporated  
 INVESTIGATOR: Memmott, FW Blackwell, RB  
 SPONSORING AGENCY: American Assn of State Hwy and Transp Officials; Federal Highway Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Spicher, RE (Tel (202)389-6741)

NCHRP 8-17



STATUS: Active NOTICE DATE: Jan. 1977 START DATE: July 1975 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$225,000

ACKNOWLEDGMENT: National Cooperative Highway Research Program

**25 135615**

**GOVERNMENT POLICIES AND R&D INVESTMENTS**

A study which aims to uncover interactive effects of government policies and instruments on R&D activity in the private sector is being undertaken. The research focuses on a set of industries and associated government policies that influence innovation at the interface of environmental, energy and transportation concerns. Specifically, the impacts of environmental, energy and transportation-related government policies which have both direct and indirect effects on R&D expenditure levels and patterns in transportation and related industrial sectors such as the pollution-control, oil and petroleum products and steel industries are being examined. Federal government units whose policies taken separately and in combination influence R&D decisions in the above industrial sectors include the Environmental Protection Agency, the Department of Transportation, and the Federal Energy Office. The principal purpose of this project is to develop quantitative relationships between the policies of these governmental units and the R&D that is undertaken in the affected industries.

PERFORMING AGENCY: Cornell University, Center for Urban Development Research

INVESTIGATOR: Cesario, FJ Isard, W

SPONSORING AGENCY: National Science Foundation, Office of National Research and Development Assessment, DA-44042

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1974 TOTAL FUNDS: \$115,900

ACKNOWLEDGMENT: Science Information Exchange (GSZ 32)

**25 135744**

**DEVELOPMENT OF AN IMPROVED TRANSPORTATION AND LAND USE MODEL PACKAGE**

This project will improve the existing Integrated Transportation and Land Use Model Package (ITLUP) developed previously by a team headed by the present principal investigator. Several existing models will be incorporated into ITLUP, including a basic employment model, a nonbasic employment model based on the Harris model, and a residential model disaggregated by income class based on the DRAM model, a derivative of IPLUM developed by the principal investigator under a previous grant. Several other existing models will be evaluated for possible integration, including modal split models, multipath assignment procedures, and air pollution emission and diffusion models. In addition, an attempt will be made to develop an operational housing characteristics model, and to incorporate simple models to investigate the energy consequences of different urban forms and transportation networks. Finally, the improved package will be used to test the impact of several policy options: Several low capital options in urban transportation will be tested such as gasoline taxes or quotas, parking taxes, parking space restrictions, and commuter taxes. The difference in the land use impacts of rail transit lines and busways will also be tested.

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of City and Regional Planning

INVESTIGATOR: Putman, SH

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-07840 A02

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$193,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1344)

**25 136065**

**TECHNIQUES FOR EVALUATING OPTIONS IN STATEWIDE TRANSPORTATION PLANNING/PROGRAMMING**

To develop transportation planning methodologies that will be policy sensitive, allowing the testing and evaluation of options in a fashion that will produce timely results for decision-making. The research will focus on reasonable cost, sketch-planning type techniques having an application to issues of statewide transportation planning as part of the programming process. Phase I of the study will identify and classify major transportation

issues, data and methodologies. Study design will be developed to test high priority methodologies. Phase II includes the development of the procedural manuals for application of techniques and the testing of techniques in states in the approved study design.

PERFORMING AGENCY: Voorhees (Alan M) and Associates, Incorporated, Planning Environment International Division, 681; System Design Concepts, Incorporated

INVESTIGATOR: Bellomo, SJ (Tel (703) 893-4310) Stowers, JR (Tel (202) 393-5911)

SPONSORING AGENCY: American Assn of State Hwy and Transp Officials; Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Spicher, RE (Tel (202) 389-6741)

**NCHRP 8-18**

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$300,000

ACKNOWLEDGMENT: Voorhees (Alan M) and Associates, Incorporated, National Cooperative Highway Research Program

**25 136128**

**DEPARTMENT OF COMMERCE REGIONAL TRANSPORTATION PLANNING**

Progress: Updated freight tariff functions to common base use by Bureau of Economic Analysis, DOC in interregional Economic Studies and I/O models. Relate and interface the impact of existing and proposed transport capabilities to the national economy. Objective: Update regional freight transportation impedances to a specified base year. Prepare national networks model for use in evaluating alternative policy and investments. Motivation: Determine the impact of freight transportation characteristics on regional economic flows. Will the rising cost of fuel likely result in a shift in shipment mode? If so, will subject mode(s) have sufficient capacity to carry additional demand? Approach: Examine existing data base and update as required. Examine coding of modes of major importance for correctness. Exercise modeling system to verify operation. Test specified alternative policy options.

PERFORMING AGENCY: National Bureau of Standards, Department of Commerce

INVESTIGATOR: Schofer, RE

SPONSORING AGENCY: National Bureau of Standards, Department of Commerce, 4314558

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 TOTAL FUNDS: \$60,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZBA 6325)

**25 138476**

**RE-USE OF ABANDONED RAILROAD RIGHTS-OF-WAY**

The purposes of this project are to develop information concerning (1) the availability of past and prospective abandoned railroad rights-of-way for conversion to alternate public purposes and (2) the advantages of establishing a rail bank to assure the availability of certain railroad rights-of-way for future railroad use, and to make recommendations as to appropriate public policy with regard to these rights-of-way. This research project will form the basis for the report to the Congress and the President which is required by section 809(a) of the Railroad Revitalization and Regulatory Reform Act of 1976.

PERFORMING AGENCY: Harbridge House, Incorporated

INVESTIGATOR: Brandwein, R (Tel (617)267-6410)

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Wilson, K (Tel (202) 426-4388)

Contract DOT-OS-60514

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1976 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$300,000

ACKNOWLEDGMENT: Office of Environment, Safety and Consumer Affairs

**25 139174**

**ECONOMICS AND REGULATION OF TRANSPORTATION**

To aid DOT in evaluating the effects of regulation in order to propose changes, the economics of scale, the effects of regulatory change and the

costs of transition from the present levels of regulation are to be investigated with particular emphasis on the rail and motor carrier industries.

Contract not yet awarded.

SPONSORING AGENCY: Office of the Secretary of Transportation  
RESPONSIBLE INDIVIDUAL: Nupp, B (Tel (202) 426-4447)

STATUS: Proposed NOTICE DATE: July 1976 START DATE: 1977

ACKNOWLEDGMENT: OST

#### 25 139175

##### INVESTMENT CRITERIA AND USER CHARGES

Research is to aid DOT in proposing appropriate changes in investment and user charge policy. With the heavy government investment in transportation and because of the effect of this on the efficiency of the entire transportation system, user charge policy must be identified. The impact of user charges on competing modes must be considered, with possible misallocation of funds tending to subsidize or cross subsidize.

Contract not yet awarded.

SPONSORING AGENCY: Office of the Secretary of Transportation  
RESPONSIBLE INDIVIDUAL: Nupp, B (Tel (202) 426-4447)

STATUS: Proposed NOTICE DATE: July 1976 START DATE: 1977

ACKNOWLEDGMENT: OST

#### 25 148329

##### THE ENERGY, ECONOMIC AND ENVIRONMENTAL CONSEQUENCES OF OVERSIZED, OVERWEIGHT VEHICLES

In recent years, the use of "oversized, overweight" vehicles (trucks) has been advocated by the trucking industry as a means of improving energy efficiency and labor productivity. For example, oversized-overweight trucks used in the Northwest's timber industry permit the transportation of about 3 1/2 times as much lumber as do conventional, "legal" vehicles. This research effort will evaluate the energy efficiency, operational savings and environmental (or highway) impacts resulting from the use of oversize, overweight trucks. Specifically, the research will focus on developing analytical techniques for modelling the operation of these vehicles over a

range of conditions. The techniques will be used to evaluate the costs, benefits and tradeoffs involved in employing oversize-overweight vehicles in both long and short term frameworks. Aspects of vehicle operation that will be considered in detail include increased costs in road construction and maintenance, congestion or traffic tie-up effects, safety issues, and questions on varying environmental impacts. Results are expected to include a set of guidelines to be used when specifying acceptable design alternatives, maximum vehicle loads, and vehicle configurations.

PERFORMING AGENCY: Oregon State University, Department of Civil Engineering

INVESTIGATOR: Hicks, RG

SPONSORING AGENCY: Federal Highway Administration

RESPONSIBLE INDIVIDUAL: Ring, GW

Contract DOT-OS-60142

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$99,998

ACKNOWLEDGMENT: DOT

#### 25 148335

##### TECHNICAL ASSISTANCE PRIORITIES ANALYSIS

This analysis is designed to consolidate needs for technical assistance as articulated by several levels of state and local governments, and determine the resources available within the Department of Transportation to meet these needs.

##### REFERENCES:

Transportation Technical Assistance Needs and Requirements Analysis: Needs Report, Diluzio, RG; Albin, PA, NTIS, Sept. 1976, PB-259680/AS

PERFORMING AGENCY: Dynatrend, Incorporated

INVESTIGATOR: Diluzio, RG (Tel (617)273-1150)

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Paulhus, NG, Jr (Tel (202)426-4208)

Contract DOT-OS-60500

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1976 TOTAL FUNDS: \$22,000

ACKNOWLEDGMENT: DOT

26 058298

**RAIL TECHNOLOGY REVIEW**

Bibliography shall contain an index based on the RRIS thesaurus, descriptive English language abstracts and the necessary bibliographic information required for input along with copies of selected documents and translations of important works in the foreign literature. Topics of investigation are nondestructive testing, stresses and strains, failure behavior, and metallurgy and production practices--all related to railroad rail.

PERFORMING AGENCY: Defense Electronics Supply Center, Department of Defense; Battelle Columbus Laboratories, Metals and Ceramics Information Center

SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Steele, RK (Tel (617)494-2002)

IA RA-75-19

STATUS: Completed NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: Mar. 1976 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: TSC (611-0186)

26 058329

**RAILROAD RESEARCH INFORMATION SERVICE (RRIS)**

Aquisition, selection, storage, retrieval and dissemination of research information that is generated by and/or that is useful to administrators, researchers, and other specialists in the railroad and related fields of transportation research. To provide a central point for industry, academia, government and others to disseminate technical information to the interested railroad related community-at-large or research results as well as on-going research efforts in the interest of obtaining technology utilization in an efficient manner. To provide a service to the research community in maintaining a current awareness of technological and economic research findings and developments.

PERFORMING AGENCY: Transportation Research Board  
INVESTIGATOR: Houser, F (Tel 202-389-6611)  
SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development  
RESPONSIBLE INDIVIDUAL: Ahmed, N (Tel 202-4260955)

Contract DOT-OS-40022/10

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 TOTAL FUNDS: \$599,500

ACKNOWLEDGMENT: FRA

26 058511

**AN ELUSIVE DIMENSION OF THE URBAN TRANSPORTATION PROBLEM: THE LAND USE-TRANSPORTATION INTERFACE**

The objective is to examine available literature concerning the land use-transportation interface which relate to the overall goal of maximizing transport efficiency in urban areas, and to write a state-of-the-art paper with recommendations for future research. This research shall identify both what is and is not known about the guidance of urban form and land development

activities in order to minimize travel in urban areas and the attendant need for new transport facilities.

PERFORMING AGENCY: Kentucky University, Department of Civil Engineering

INVESTIGATOR: Deacon, JA

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Cooper, NL (Tel 202-4264380)

Contract DOT-OS-50111 (CS)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$32,206

ACKNOWLEDGMENT: TRAIS (PUR-50147), OST

26 099429

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT, PHASE 4-LITERATURE REVIEW**

Background experience and literature in the various technical areas of interest under the Project are continually under review. A reference library has been established and maintained under this Phase.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel 312-5673607)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

26 135521

**SCIENTIFIC AND TECHNICAL INFORMATION CENTER FOR SOIL MECHANICS**

Purpose of study/investigation: To establish and operate a Soil Mechanics Information Analysis Center. Approach or plan: Center will acquire, analyze, evaluate, and condense the world's literature in the area of soil mechanics. Information is screened, filtered, and reduced to meet user requirements for management and for bench scientists and engineers throughout the DOD. Services include specific items of evaluated data, current summaries of technical trends, comprehensive state-of-the-art analyses, and specialized advisory services.

PERFORMING AGENCY: Waterways Experiment Station, Army Corps of Engineers

INVESTIGATOR: Cunny, RW

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 144 1)



# Source Index

This index serves not only as the reference for the publications and the corporate affiliations of authors of documents appearing in this Bulletin but also as the source for addresses of organizations that do not appear on pages vii and viii. In general, if no address is listed after the name of an organization, the entry involves an author affiliation rather than a publication. Consequently, there are multiple listings for

many organizations, and all the document numbers should be checked. Some organizations have more than one office, and again there will be more than one listing of document numbers of possible interest. Each summary of ongoing research is indicated not only by the *A* in the document number but also by the use of italics for the entire number.

## A

**AASHTO QUARTERLY** American Assn of State Hwy and Transp Officials; 341 National Press Building; Washington, D.C., 20004

25 147896

**ABT ASSOCIATES, INCORPORATED** 55 Wheeler Street; Cambridge, Massachusetts, 02138

*00A 058470, 00 143228*

**ACCIDENT ANALYSIS AND PREVENTION** Pergamon Press; Maxwell House, Fairview Park; Elmsford, New York, 10523

07 137692, 08 098629

**ACOUSTICAL PUBLICATIONS, INCORPORATED** 27101 East Oviatt; Bay Village, Ohio, 44140

10 148299, 10 148313, 10 148314, 10 148315

**ACOUSTICAL SOCIETY OF AMERICA, JOURNAL OF** Acoustical Society of America; 335 East 45th Street; New York, New York, 10017

09 144071

**AEROSPACE CORPORATION** Energy and Resources Division; El Segundo, California

23 143964

**AEROSPACE CORPORATION** Energy and Transportation Division; El Segundo, California

16 143963, 23 143962

**AEROSPACE CORPORATION** 2350 East El Segundo Boulevard; El Segundo, California, 90245

23 145554

**AEROSPACE MEDICAL RESEARCH LABORATORY** Wright-Patterson AFB, Ohio, 45433

12 133077

**AERZTLICHE DIENST DER DB** German Federal Railway; Darmstadt, West Germany

07 139495

**AGRICULTURAL MARKETING RESEARCH INSTITUTE** Market Operations Research Laboratory; Beltsville, Maryland 20705

*22A 099638, 22A 099639*

**AGRICULTURAL MARKETING RESEARCH INSTITUTE** Transportation and Packaging Research Laboratory; Beltsville, Maryland, 20705

*22A 099637, 22A 138400*

**AGRICULTURAL RESEARCH SERVICE** Agricultural Marketing Research Institute; Beltsville, Maryland, 20705

*20A 083507, 20A 083508, 22A 083506, 22A 083511*

**AGRICULTURAL RESEARCH SERVICE** Department of Agriculture; P.O. Box 110; Dawson, Georgia, 31742

*22A 138363*

**AGRICULTURAL RESEARCH SERVICE** Department of Agriculture; P.O. Box 8143; Fresno, California, 93727

*22A 138375*

**AGRICULTURAL RESEARCH SERVICE** Department of Agriculture; P.O. Box 113; East Grand Forks, Minnesota 56721

*10A 138380*

**AGRICULTURAL RESEARCH SERVICE** Market Quality Laboratory; P.O. Box 112; Riverside, California, 92502

*22A 099640*

**AGRICULTURAL RESEARCH SERVICE** Market Quality Research Laboratory; College Station, Texas, 77840

*22A 099648*

**AGRICULTURAL RESEARCH SERVICE** Nematology Research Laboratory; P.O. Box 267; Weslaco, Texas, 78596

*22A 099641*

**AGRICULTURAL RESEARCH SERVICE** Transportation Facilities Division; Beltsville, Maryland, 20705

*21A 107295*

**AGRICULTURAL RESEARCH SERVICE** Western Region Oregon-Washington Area; 3706 West Nob Hill Bouvelard; Yakima, Washington, 98902

*22A 099624*

**AIRESEARCH MANUFACTURING COMPANY OF CALIFORNIA** 2525 West 190th Street; Torrance, California, 90509

02 147575, *04A 048972*, 11 147572, 11 147576

**ALABAMA UNIVERSITY, HUNTSVILLE** Department of Electrical Engineering; Huntsville, Alabama

*02A 148322*

**ALASKA UNIVERSITY, COLLEGE** College, Alaska, 99701

*20A 055810*

**ALASKA UNIVERSITY, COLLEGE** Department of Agricultural Sciences; College, Alaska, 99701

*20A 083440*

**ALL-UNION CORRESPONDENCE INST RAILROAD ENGINEERS** Moscow, USSR

13 130293

**ALL-UNION LABOR RED BANNER RAILWAY RESEARCH INST USSR** Ministry of Railways; Moscow, USSR

00 130205, 00 130208, 00 130209, 01 130200, 01 130201, 01 130202, 01 130210, 01 130211, 01 144447, 01 144450, 01 144459, 02 144457, 03 130213, 04 130207, 06 130048, 09 144451, 09 144456, 09 144460, 09 144473, 13 130047, 13 130049, 13 130050, 13 130051, 13 130052, 13 130053, 13 130206, 13 130243, 13 130292, 13 130300, 13 142606, 18 130247, 21 130198, 23 142605

**ALL-UNION SCIENTIFIC RES INST OF RAILROAD HYGIENE** Moscow, USSR

07 130305, 07 130306, 07 130307

**AMERICAN ASSN OF STATE HWY AND TRANSP OFFICIALS** 341 National Press Building; Washington, D.C., 20004

*00A 138477, 00 141112, 25A 135115, 25A 136065*

## Source Index

**AMERICAN CHEMICAL SOCIETY** Division of Industrial and Engineering Chemistry; Washington, D.C., 20036  
20 142533

**AMERICAN IRON AND STEEL INSTITUTE** 150 East 42nd Street; New York, New York, 10017  
01A 099393

**AMERICAN PUBLIC TRANSIT ASSOCIATION** 1100 17th Street, NW; Washington, D.C., 20036  
25 137436

**AMERICAN RAILWAY BRIDGE AND BUILDING ASSOC** 18154 Harwood Avenue; Homewood, Illinois, 60430  
00 139954, 00 139955, 00 139956, 00 139957

**AMERICAN RAILWAY ENGINEERING ASSOCIATION** 59 East Van Buren Street; Chicago, Illinois, 60605  
00 139942, 00 139943, 01 139939, 01 139941, 01 139946, 06 139945, 09 139940, 10 139944

**AMERICAN SOCIETY OF LUBRICATION ENGINEERS** 838 Busse Highway; Park Ridge, Illinois, 60068  
16 147834, 16 147835

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS** 345 East 47th Street; New York, New York, 10017

02 145139, 02 145140, 02 145148, 02 145149, 02 145150, 02 145151, 02 145152, 02 145154, 02 148251, 02 148263, 03 141115, 03 145141, 03 145142, 03 145144, 03 145145, 03 145147, 03 148252, 03 148254, 04 145146, 04 148248, 04 148250, 04 148253, 11 145153, 12 148255, 13 148249, 15 148260, 17 145143, 17 148261, 17 148270, 18 148256, 21 148265, 21 148266, 22 148267, 22 148268, 23 148258, 23 148259, 23 148262, 23 148264, 25 148257, 26 148247

**AMERICAN TRANSIT ASSOCIATION** 465 L'Enfant Plaza West, SW; Washington, D.C., 20024  
06 136408, 06 136412, 04 136409, 23 136410

**AMES RESEARCH CENTER** Aeronautics and Space Technology Office, NASA; Moffett Field, California, 94035  
00A 135249

**AMES RESEARCH CENTER** National Aeronautics and Space Administration; Moffett Field, California, 94035  
00A 135249, 12A 058266

**ANDERSEN (ARTHUR) AND COMPANY** 815 Connecticut Avenue, NW; Washington, D.C., 20006  
17A 099419

**ANNUAL SIMULATION SYMPOSIUM** Tampa, Florida  
11 139505

**ARCHITECTS JOURNAL** Architects Press Limited; 9 Queen Annes Gate; London SW1, England  
25 138808, 25 147640

**ARCHIV FUER ELEKTROTECHNIK** Springer-Verlag; 175 Fifth Avenue; New York, New York, 10010  
11 141101

**AREA BULLETIN** American Railway Engineering Association; 59 East Van Buren Street; Chicago, Illinois, 60605  
01 145137

**ARIZONA STATE UNIVERSITY, TEMPE** Department of Mechanical Engineering; Tempe, Arizona, 85281  
02A 058508

**ARIZONA STATE UNIVERSITY, TEMPE** Tempe, Arizona, 85281  
02A 058508

**ARKANSAS UNIVERSITY, FAYETTEVILLE** Department of Agricultural Economics and Rural Sociology; Fayetteville, Arkansas, 72701  
22A 083444

**ARKANSAS UNIVERSITY, FAYETTEVILLE** Water Resources Research Center; University Hall; Fayetteville, Arkansas, 72701  
11A 130488

**ARKANSAS UNIVERSITY, LITTLE ROCK** Graduate Institute of Technology; Little Rock, Arkansas, 72204  
00A 058302, 00 133298

**ARMY CORPS OF ENGINEERS** Department of the Army; Forrestal Building; Washington, D.C., 20314  
00A 082313, 00A 135516, 00A 135518, 00A 135550, 09A 135495, 26A 135521

**ARZTLICHER DIENST DB** Darmstadt, West Germany  
12 142309

**ASCE CIVIL ENGINEERING** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017  
00 142936, 00 147682, 19 142926

**ASCE JOURNAL OF THE CONSTRUCTION DIVISION** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017  
09 147829

**ASCE JOURNAL OF THE ENGINEERING MECHANICS**

**DIVISION** American Society of Civil Engineers; 345 East 47th Street; New York, New York, 10017  
01 139488

**ASCE JOURNAL OF THE ENVIRONMENTAL ENGINEERING**

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