



# RAILROAD RESEARCH BULLETIN



**Autumn 1977  
Volume 4 Number 2**

RRIS accessions between  
February 1977 and July 1977

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

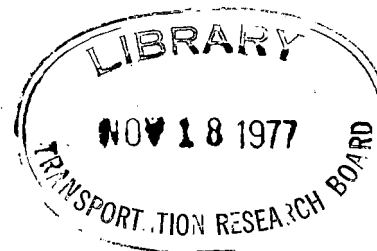
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Transportation Research Board**

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# RAILROAD RESEARCH BULLETIN

**Autumn 1977**  
**Volume 4 Number 2**  
**Publication 7702**



This Bulletin, containing 1269 abstracts of journal articles, research reports, computer programs, and magnetic tape data sets and 581 summaries of ongoing research activities in the railroad field, covers material accessioned by the Railroad Research Information Service between February 1977 and July 1977. 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 and light rail transit. All items in the RRIS file are classified according to the basic system, and there is a 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	TsNIIITEI*	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
- AAR**  
For technical reports identified by a report number such as R-253:  
Association of American Railroads Technical Center  
3140 S. Federal Street  
Chicago, Illinois 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 Tupik 6A  
Moscow B-174, USSR
- MPS**  
USSR Ministry of Railways  
Novo-Basmannaya, ul.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

disclosed in reports are not acquired automatically when right-of-use is acquired. Such rights must be arranged separately between the report user and the owners of the patent or design.

Certain international standards organizations (such as ISO) and certain universities, technical colleges, and libraries are not subjected to right-of-use fees. However, these organizations must ensure that ORE information is not used for commercial purposes, and reports distributed under these conditions are stamped "right-of-use not acquired."

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-

fornia 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 performed 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.

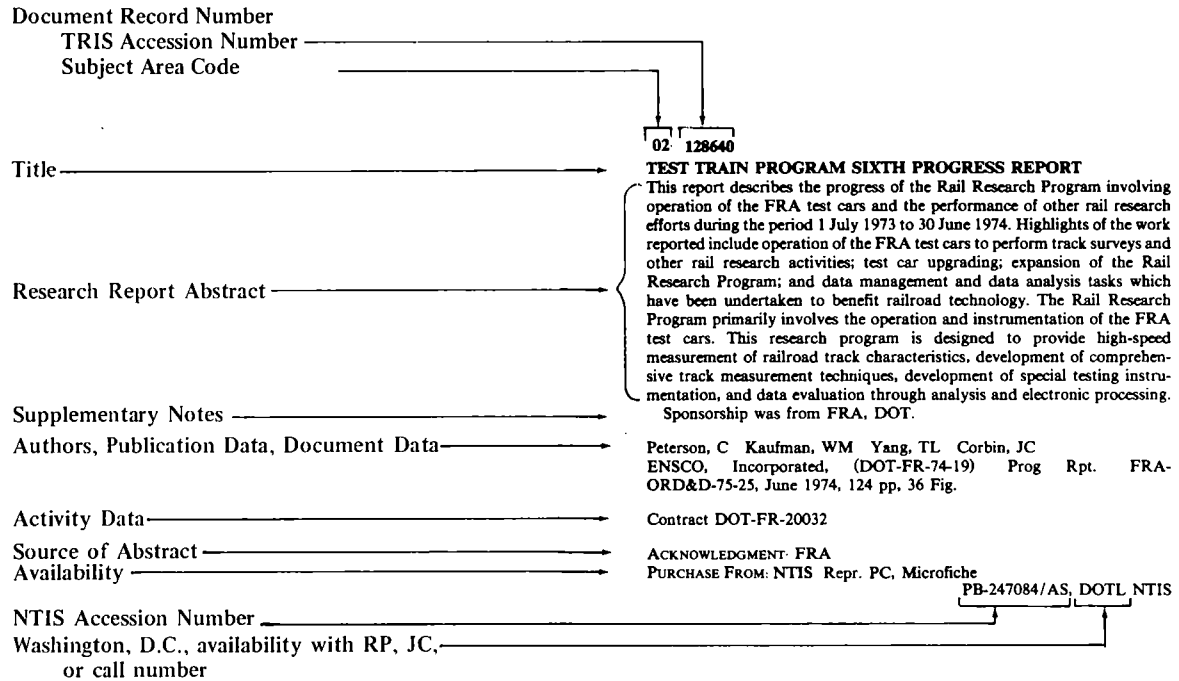
The fee schedule for RRIS file searches reflects the primary support for the service from the Federal Railroad Administration and the nonprofit nature of all National Research Council information services. The charge for computer retrieval from the RRIS file is \$50 per request plus \$0.25 per citation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

# Sample Abstracts

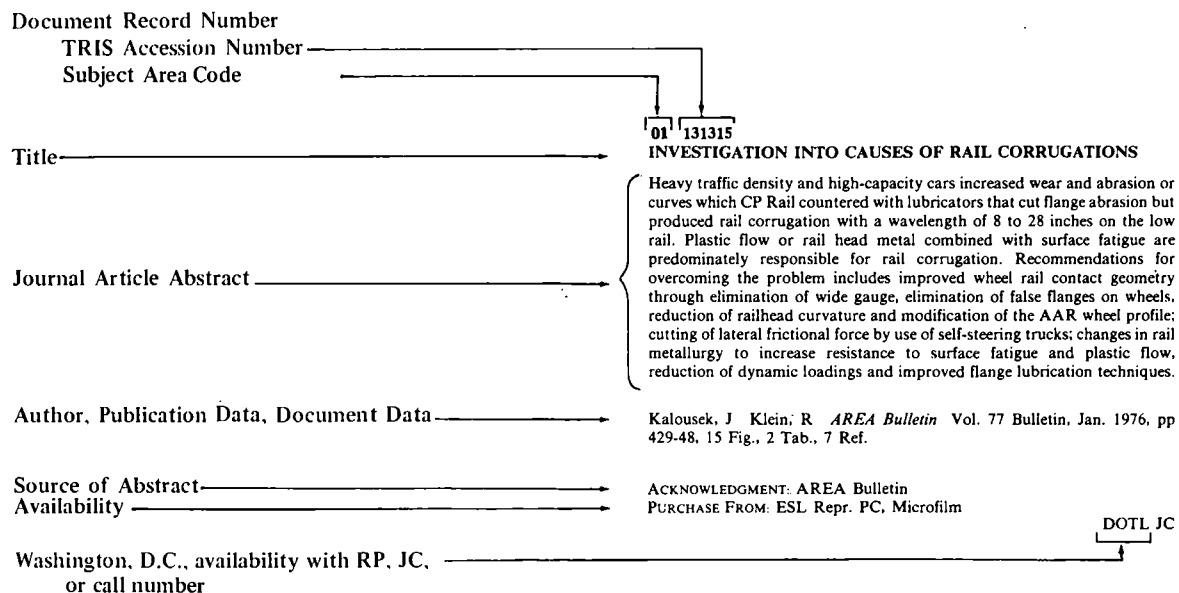
Abstracts are classified according to an 8-digit document record number: The first 2-digits indicate the RRIS subject area number and the last 6 digits indicate the TRIS accession number, which is a unique number assigned to each document. The subject area number and the subject area appear at the tops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



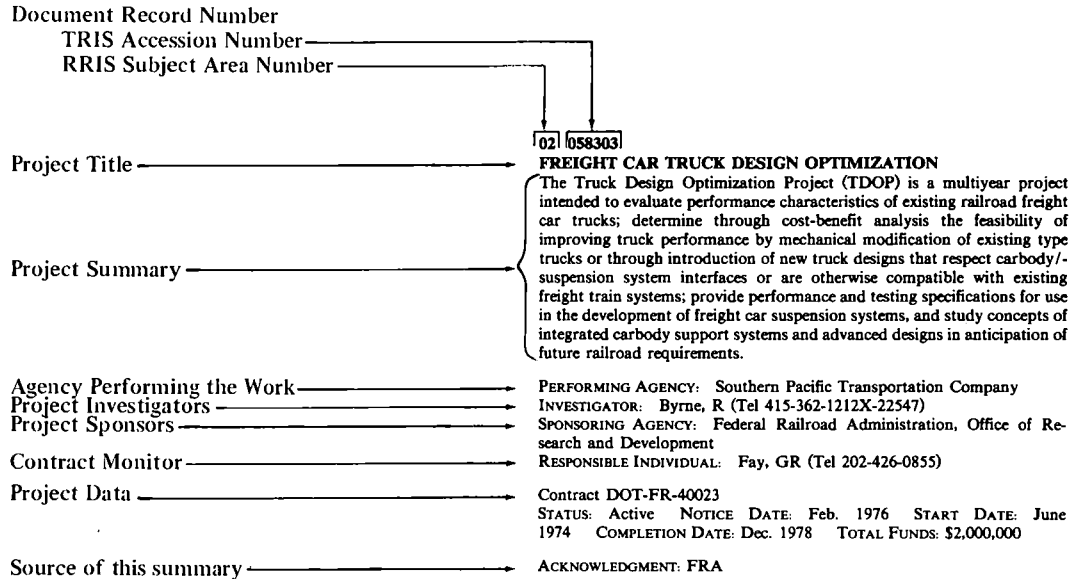
## ABSTRACT OF A JOURNAL ARTICLE



# 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 052847

## DETERMINATION OF DYNAMIC FORCES IN BRIDGES. THEORETICAL STUDY OF DYNAMIC FORCES IN BRIDGES

This report concerns theoretical studies of dynamic forces in bridges. First, simplified methods of calculation are described, then two mathematical models computed by the BR and the CSD and their applications are given. [French]

Restrictions on the use of this document are contained in the explanatory material. Abstract only available in English.

International Union of Railways D23/RP 16/E, Apr. 1970, 36 pp, 26 Fig., 2 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 052906

## PROBLEM OF THE WEEDING OF TRACKS. ENQUIRY REPORT, DOCUMENT NO. 1

During its meeting of November 5th and 6th 1957, the Control Committee of ORE added the question "Weeding of tracks" to the work programme of ORE, and entrusted the ORE-Bureau with the task of drawing up a preliminary report on this subject. The ORE-Bureau then sent a concise questionnaire to some Member-Administrations of ORE and contacted the specialists of certain Administrations. Information was also requested from the AAR. The data collected--which are the subject of this report--are rather contradictory. In fact, most Administrations apply the traditional method of weeding by contact, and use sodium chlorate or, sometimes, sodium chlorate mixed with other products, and justify this choice by economic considerations. One Administration, however, recently abandoned this method and now uses products based on urea for sterilizing the soil. In this particular case, the very high price of the weed-killer is compensated by a greater effectiveness and by a lengthening of the interval between two consecutive weeding operations. However this may be, there is, at present, no economic and fully effective weed-killer. But, in any case, experience shows that if the same chemical weeding product is used every year, a variety of plants resistant to this product appears, and multiplies rapidly on account of the decreased growth of other plants. This consideration may induce the Administrations to resort to the alternating or successive use of different weed-killing products or, to another line of action. In short, only the policy that an Administration intends to pursue, the species of plants normally encountered, and a complete economic study allowing for national demands, can definitely decide the choice of product to be used. Moreover, the data collected show that it is possible to obtain a greater effectiveness for a fixed total weeding expenditure, by choosing not only better weed-killing products, but also by improving the method according to which these products are used, and by improving the weeding equipment.

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

International Union of Railways D40/RP 1/E, Nov. 1958, 32 pp

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 052909

## BRAKING AND ACCELERATION FORCES ON BRIDGES. FORCE MEASURING CELLS

This report describes development of load cells for measuring reactions between superstructure and abutments or piers. Small scale models were tested to verify principles. To limit the necessary lift of bridge superstructures, proportions of practical units were restricted. The consequences lead to adoption of certain strain gauge configurations giving satisfactory calibration.

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

International Union of Railways D101/RP 2/E, Apr. 1970, 20 pp, 24 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 053207

## INVESTIGATION OF BRIDGE DECKS WITH CONCRETE ENCASED GIRDERS. TWIN-SPAN CONTINUOUS BRIDGE DECK. TESTS UNDER STATIC LOADS

A bridge deck consisting of four concrete-encased steel girders and forming two continuous spans each 19 m long was constructed in the laboratories of the CEBTP. This deck was first subjected to 2 million repeated load cycles corresponding to that supported in service by the centre support; this test was covered by report RP 5. The present report describes the static loading of the same deck until failure at the centre support. Incipient plasticising of the upper flange of the girder on the centre support occurred under a load corresponding to about twice the service load, and the concrete on the underside of the centre support was crushed under an applied load equivalent to about 3.3 times the service load.

International Union of Railways D123/RP 7/E, Apr. 1976, 25 pp, 36 Fig., 10 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 090683

## CONSTRUCTION MANAGEMENT (A BIBLIOGRAPHY WITH ABSTRACTS)

The report includes management studies on the physical, social, and environmental factors of the construction industry. Cost and design studies are also included for military and civilian construction of buildings, houses, mobile homes, tunnel excavation, and roads. To aid the manager in planning and control, construction codes, data management, and contract administration research are also cited. (Contains 103 abstracts).

Supersedes COM-73-11798.

Grooms, DW  
National Technical Information Service Bibliog. Apr. 1975, 108 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-75/253/5ST, DOTL/NTIS

00 096790

**GEOLOGICAL-GEOTECHNICAL AERIAL PHOTO INTERPRETATION [Geologisk-geoteknisk flygbildstolkning]**

This method is used increasingly for outline surveys for planning purposes. The aerial photographs give a rough classification of geotechnical conditions and indicate areas which merit further study. The photographs are interpreted using stereoscopes or a Wild A8 stereoscopic instrument, the soil type boundaries being directly transferred from aerial photograph to ground map. It is possible to distinguish between rock, moraine, coarse sediment, fine sediment and organic soils. Interpretation must always be combined with field surveys and comparisons with previous investigations. A survey of this type was performed on the Brannas Peninsula in order to provide geotechnical data for a proposed industrial development. /TRRL/ [Swedish]

Waldenstoem, L. *Orrjekontakt* No. 32, 1974, 3 pp, 1 Fig., 3 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 212457), National Swedish Road & Traffic Research Institute (VTIN20011E)  
ORDER FROM: Orrjekontakt, Fack, Stockholm, Sweden

00 096973

**SOME NOVEL TECHNIQUES IN PRECAST CONSTRUCTION**

The article discusses four methods for overcoming transportation problems of handling long precast concrete beams for large spans. The methods involve the use of reinforced concrete box or u-beam segments designed to be prestressed together on site to form a single unit. In method 1 the segments have shaped ends from which protrude prestressing strands which are connected on-site using couplers. A development of this method is used in method 2, in which continuous, flexible tendons are used to join the beam segments. For handling, the segments are folded using the flexibility of the tendons and unfolded on-site. A further development of this method is used in method 3 in which a steel rocker bar is located in grooves formed on the compression side of the beam segment ends. Method 4 involves the use of precast segmental beams of reinforced concrete in place of pre-stressed concrete again using flexible reinforcement throughout the segments for ease of handling. /TRRL/

Taylor, R (Manchester University, England) *Concrete* Vol. 8 No. 8, Aug. 1974, pp 32-34, 4 Fig., 5 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 212022)  
ORDER FROM: ESL

DOTL JC

00 125247

**THE CONSTRUCTION OF THE SEIKAN TUNNEL [La construction du Tunnel de Seikan]**

The Seikan Tunnel will link the Northern Hokkaido Island to the Main Honshu Island in Japan under the Strait of Tsugaru. It will be the longest railway tunnel in the world. The main characteristics of the tunnel are described: total length (53,850 km), length under the sea (23,300 km), maximum depth of the strait (140 m), depth of the tunnel under the bottom of the sea (100 m), cross-section of the main double-track tunnel (9,60 m), minimum radius of curvature (6500 M), longitudinal gradients (12 for 1000 and 3 for 1000). Volcanic rocks lay under the sea for a third of the width and sedimentary rocks from the Miocene era for the other two thirds. Site investigations showed three main zones: north side (Hokkaido): tuff (sigma 40 kg/cm<sup>2</sup>) / south side (Honshu): harder rock (sigma 700 kg/cm<sup>2</sup>) / to the north and the centre: microcracks and small amount of water; to the south: faults with important ingress of water. It is not envisaged to take special precautions against earthquakes. An outline is given of the main drilling operations. It is forecasted that progress will be 300 m/month with the Telescopic Atlas Copco drilling machine (4 m cutting diameter; rate of progress: 2 m/h; overall power: 440 kw; total weight 95t). The work carried out 6 days per week, day and night, with three teams enables 1500 m to be completed the first year; the following 800 m took nearly two years. The terrain crumbled easily and necessitated support by means of metal arches and mesh fixed into position with shotcrete placed immediately behind the jacks of the machine. Those arches are placed into position without stopping the machine every 0,80 to 1,20 m and even every 0,60 m. The final reinforced concrete lining will be 0,70 M thick. After the first 1500 m section, the strength of the rock diminished progressively resulting in the machine being abandoned. Investigations are being conducted to decide on the next drilling method. The total cost of the work is estimated at 200 milliards yens per km

of the railway tunnel which will have two tracks and two service galleries. The end of the work is programmed for May 1976. [French]

Ruffert, G (Torkret GmbH) *Travaux Souterrains* No. 174, Mar. 1973, pp 25-28, 3 Fig.

ACKNOWLEDGMENT: Laboratoire Central des Ponts et Chaussées, TRRL (IRRD 101138)  
ORDER FROM: PYC-Edition, 254 rue de Vaugirard, Paris 15e, France

00 128598

**CONTINUOUS RAILROAD BRIDGES DESIGN STUDY**

Continuous Railroad Bridges Design Study has produced a computer program which will analyze a steel type continuous railroad bridge. The bridge may have one or up to a maximum of four continuous spans. Main longitudinal members may be prismatic or non-prismatic, may contain more than one type of steel and should be composed of rolled beams or constant depth plate girder only. The program takes into account any settlements at supports, if specified. The loading is Copper E-80 or any other combination of series load. The program computes the loading on floor beams and designs them accordingly. The bridge may have open deck or ballasted deck supported by steel floor plate. The program language is FORTRAN IV Basic and was developed on IBM 1130-16K System. It can be readily implemented on any compatible or bigger system. With some judicious rearrangement the program may be implemented on IBM 1130-8K or any other similar small system. The Study was oriented toward practicing engineers and the program should result in considerable savings of time and effort.

Research sponsored by the Ohio Department of Transportation, and conducted in cooperation with the U. S. Department of Transportation, Federal Highway Administration.

Kale, VR  
Optimum, Incorporated Final Rpt. OHIO-DOT-23-74, Dec. 1974, 76 pp, Figs., Tabs.

HP&amp;R 14255(0)

ORDER FROM: Ohio Department of Transportation, 25 South Front Street, Columbus, Ohio, 43215

DOTL RP

00 141588

**ANALYSIS OF BRIDGE COLLISION INCIDENTS-VOLUME I**

This report is Volume One of a two part study of river towboat collisions with bridges. The study is devoted to a review of accidents during the period Fiscal (FY) 1970 through 1974. During this time there were 811 accidents at bridges resulting in \$23,153,000 in damage and 14 fatalities. The purpose of this study is to investigate bridge accidents by studying accident reports, waterway characteristics, bridge configurations, environmental conditions, and any other information which might be helpful in defining the problem. Certain bridges were selected for detailed investigation based on numbers of accidents during the sample period. It was not intended to study all problem bridges. It was intended to concentrate on a selected bridge sample to determine what problems are unique to each bridge and what problems are common between bridges, if any.

The U.S. Coast Guard's Research and Development technical representative for the work performed herein was L.J. Olson.

Dayton, RB  
Operations Research, Incorporated, (ORI-TR-1016) Final Rpt. CG-D-77-76, May 1976, 415 pp

Contract DOT-CG-31446-AT018

ACKNOWLEDGMENT: United States Coast Guard (G-DST-2)  
ORDER FROM: NTIS

AD-A029034, DOTL NTIS

00 142841

**AN OCCURRENCE AND DISTRIBUTION SURVEY OF EXPANSIVE MATERIALS IN THE UNITED STATES BY PHYSIOGRAPHIC AREAS**

The report concludes a study of physiographic areas within the continental United States which contain sources of potentially expansive materials. Following the definition of the physiographic provinces, generalized maps

were developed which give a subjective indication of the occurrence and distribution of potentially expansive materials. Narrative descriptions which include lithology, geologic age, stratigraphic association, and mineralogy of the potentially expansive geologic units are included to complement the maps. The information within the report is designed to provide additional working knowledge of expansive materials to forewarn soils and pavement design engineers of impending problems. The most troublesome expansive materials consist of argillaceous sediments, shales, or less frequently occurring residual soils of the Mesozoic age or younger which have undergone minor modification by either deep burial or tectonism. Although montmorillonite may occur in several geologic environments, its presence in marine sediments is most common and contributes to widespread occurrence of expansive materials, notably in the Great Plains and Gulf and Atlantic Coastal Plains Physiographic Provinces.

Sponsored by DOT and FHWA.

Patrick, DM Snethen, DR  
Waterways Experiment Station Intrm Rpt. FHWA-RD-76-82, Jan. 1976,  
73 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265230/3ST, DOTL NTIS

**00 143760**  
**SUBSURFACE INVESTIGATION, SECTION F003, BRANCH**  
**ROUTE**

Results are summarized of thirteen supplementary borings made at the location of sewer crossings on M street in southeast Washington, District of Columbia and at selected locations within the Washington Naval Shipyard. The borings were performed to investigate conditions at the planned crossing of the subway tunnels beneath the M Street sewers and to ascertain the character of deep bearing strata for high-load underpinning piles to be installed within the Navy Yard. The report contains geological sections incorporating the new borings, logs of these borings, results of laboratory tests on soil samples obtained and a discussion of anticipated design and construction problems. This investigation is for the Washington Area Metro System.

Sponsored in part by Washington Metropolitan Area Transit Authority, D.C.

Mueser, Rutledge, Wentworth, & Johnston, Washington Metropolitan  
Area Transit Authority MRWJ-76-148, Rept. No. 8, July 1976, 56 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-255888/0ST, DOTL NTIS

**00 143805**  
**TUNNEL CONSTRUCTION, VOLUME 4, 1976 (CITATIONS**  
**FROM THE ENGINEERING INDEX DATA BASE)**

Unique tunneling methods, cost studies, tunnel support innovations, tunneling machines, and soil and rock properties encountered are investigated in these reports gathered in a worldwide literature survey. Vehicular, water, sewage, and mine tunnels are reviewed. Finite element analysis is used extensively for investigation of soil and rock mechanics. (Contains 56 abstracts)

See also NTIS/PS-76/0647.

Habercom, GEJ  
National Technical Information Service Intrm Rpt. Aug. 1976, 63 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-76/0651/0ST, DOTL NTIS

**00 143806**  
**TUNNEL CONSTRUCTION, VOLUME 3, 1975 (CITATIONS**  
**FROM THE ENGINEERING INDEX DATA BASE)**

Unique tunneling methods, cost studies, tunnel support innovations, tunneling machines, and soil and rock properties encountered are investigated in these reports gathered in a worldwide literature survey. Vehicular, water, sewage, and mine tunnels are reviewed. Finite element analysis is used extensively for investigation of soil and rock mechanics. (Contains 194 abstracts)

See also NTIS/PS-76/0647.

Habercom, GEJ  
National Technical Information Service Intrm Rpt. Aug. 1976, 201 pp

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-76/0650/2ST, DOTL NTIS

**00 143808**  
**TUNNEL CONSTRUCTION, VOLUME 1, 1970-1972 (CITATIONS**  
**FROM THE ENGINEERING INDEX DATA BASE)**

Unique tunneling methods, cost studies, tunnel support innovations, tunneling machines, and soil and rock properties encountered are investigated in these reports gathered in a worldwide literature survey. Vehicular, water, sewage, and mine tunnels are reviewed. Finite element analysis is used extensively for investigation of soil and rock mechanics. (Contains 256 abstracts)

See also NTIS/PS-76/0647.

Habercom, GEJ  
National Technical Information Service Intrm Rpt. Aug. 1976, 261 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-76/0648/6ST, DOTL NTIS

**00 143809**  
**TUNNEL CONSTRUCTION (CITATIONS FROM THE NTIS DATA**  
**BASE)**

Unique tunneling methods, cost studies, tunnel support innovations, tunneling machines, and soil and rock properties encountered are investigated in these Government-sponsored research reports. Vehicular, water, sewage, and mine tunnels are reviewed. Finite element analysis is used extensively for investigation of soil and rock mechanics. (This updated bibliography contains 245 abstracts, 65 of which are new entries to the previous edition.)

Supersedes NTIS/PS-75/550, NTIS/PS-74/096, and COM-73-11390. See also NTIS/PS-76/0648, NTIS/PS-76/0649, NTIS/PS-76/0650, and NTIS/PS-76/0651.

Habercom, GEJ  
National Technical Information Service Intrm Rpt. Aug. 1976, 250 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-76/10647/8ST, DOTL NTIS

**00 146692**  
**SELECTED BIBLIOGRAPHY ON FIBER-REINFORCED CEMENT**  
**AND CONCRETE**

A listing of 660 references with author index is given for fiber reinforced cement and gypsum matrices, mortars, and concretes. Fiber types include steel, glass, plastic, asbestos, organic, carbon, and others. (Author)

Hoff, GC Fontenot, CM Tom, JG  
Waterways Experiment Station Final Rpt. AEWES-MP-C-76-6, Aug.  
1976, 67 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A032082/0ST, DOTL NTIS

**00 147032**  
**PROJECT PLANNING AND CONTROL IN TUNNEL**  
**CONSTRUCTION**

In recent years, the complexity of construction projects has forced project managers to develop better planning control techniques. Tunnels present serious problems due to the presence of high uncertainty and risk in their construction. This report describes the development of a project planning and control system (PCS) for tunneling. The approach taken follows the methodology used in information systems of the type used in the manufacturing and service industries. A review of the current trends in the information systems field and a survey of a group of possible users (tunneling managers) were made and the resulting information used as a background for the development of the system. Existing systems developed for tunnel applications were reviewed to determine whether they could be incorporated into the proposed system. From the systems surveyed, the Tunnel Cost



Model presents an adequate approach. The development is geared at improving the areas in which the existing system lacked flexibility. Improvements were made in the simulation of construction operations and in the project scheduling capabilities. A case study is included demonstrating the use of the options developed in the planning of the construction operations and the overall tunnel.

See also PB-245 835. Also pub. as Tunnel Construction-8.(PC A013/MF A01)

Suarez-Reynoso, S  
Massachusetts Institute of Technology, National Science Foundation Tech.  
Rpt. MIT-R76-28, NSF/RA-760244, May 1976, 299 pp

Grant NSF-GI-34029

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-259273/1ST, DOTL NTIS

00 147456

#### BRIDGE FAILURES

The article gives brief details of causes of bridge failure indicated by tables classified by-failures during construction; failures within two years of completion; failures more than two years after completion. The failures are summarized and comments offered as guidance for future action. /TRRL/

Smith, DW (Dundee University, Scotland) *Institution of Civil Engineers, Proceedings Analytic* Vol. 60 Aug. 1976, pp 367-382, 4-Tab., 70 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 221982)  
ORDER FROM: ESL

DOTL JC

00 147940

#### FINLAND'S FROZEN TUBE

Gives details of the problems associated with the Kluuvi cleft region of the proposed Helsinki metro. The underground section passes through this glacial cleft which is filled with alluvial water-bearing deposits. Compressed air and grouting methods are considered to be unlikely to be satisfactory because of the high water table, instability of the fill and doubts as to the origin of the water. Ground freezing methods have therefore been proposed for this 40 M section of the tunnel, which is to be lined with a cast iron circular lining. The remainder of the tunnel is in strong rock requiring no lining. The article discusses the advantages and disadvantages of the two freezing methods that have been proposed. The vertical method involves freezing from the surface and avoids disturbance of the water table. However, it would interfere with surface activities and would need insulation to avoid the heave that would result from freezing the entire block of ground. The horizontal method would probably need drilling from two chambers and from both ends and would also require the provision of compressed air in the workings. Because neither method was obviously best, tenders were called for prices on either scheme. /TRRL/

*Consulting Engineer* Vol. 40 No. 4, 1976, 2 pp, 3 Fig.

ACKNOWLEDGMENT: TRRL (IRRD 221488)  
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00 148579

#### PLANNING AND CONSTRUCTION OF LONG TUNNELS IN THE OKAYAMA-HAKATA SECTION OF THE SANYO SHINKANSEN

Long tunnels are essential in constructing the Shin Kansen high-speed routes. The 398-km Hakata extension includes 111 tunnels with a total length of 222 km, including the 18.7-km undersea tunnel between Honshu and Kyushu. Design and construction of that bore and four other major tunnels on the route are described.

Horiuchi, Y (Japanese National Railways) *Japanese Railway Engineering*  
Vol. 16 No. 1, 1975, pp 11-15, 9 Fig., 3 Tab.

ORDER FROM: ESL

DOTL JC

00 148590

#### A COMPUTER MODEL FOR SIZING RAPID TRANSIT TUNNEL DIAMETERS

A computer program was developed to assist the determination of minimum tunnel diameters for electrified rapid transit systems. Inputs include vehicle shape, walkway location, clearances, and track geometrics. The program written in FORTRAN IV calculates the locations of six critical points with respect to the top of the low rail. Twenty triplets of points are considered, each triplet defining a possible circle. Circles not containing all six points are discarded and the minimum-diameter circle is selected. An additional plotting option is available to provide a visual presentation of tunnel, vehicle envelope, and walkway envelope.

Co-sponsors of this report were the Office of the Assistant Secretary for Systems Development and Technology, and the Urban Mass Transit Administration, DOT, under contract to Transportation Systems Center, Cambridge, Massachusetts.

Wyman, FP Hefland, HJ

Bechtel Corporation, (DOT-TSC-OST-75-49) Final Rpt. DOT-TSC-OST-75-49, UMTA-MA-06-0025-7518, Jan. 1976, 104 pp

IA DOT-TSC-601

ACKNOWLEDGMENT: DOT  
ORDER FROM: NTIS

DOTL NTIS

00 148606

#### 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 98-105, 2 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: Derry and Sons, Limited, Canal Street, Nottingham, England

DOTL JC

00 148608

#### STUDY OF TRACK-STRUCTURE INTERACTION [Etude de l'interaction. Voie-ouvrage d'art]

Study of stress and strains resulting from the dissimilar characteristics of RATP and SNCF bridge foundations. The results, in figures, of a theoretical analysis of the effects of expansion, braking and bending of the bridge platform are compared against currently accepted experimental values. Simulation of various examples has made it possible to determine theoretically the bridge spans which require expansion devices as well as those stresses caused by expansion which must be taken into account. Measurements are currently being taken on the Macon (SNCF) bridge and should provide the information required for the purposes of making a comparison. [French]

Serra, Y Voignier, P

Ecole Nationale des Ponts et Chaussees SNCF Cat. No. 40-N47, No Date, 204 pp, Figs., Refs., Apps.

ACKNOWLEDGMENT: UIC

ORDER FROM: French National Railways, Research & Development Department, 24 rue Cambaceres, Paris 8e, France

00 148621

#### SOFT ROCK ENGINEERING IN THE CENTRAL NORTH ISLAND OF NEW ZEALAND

Approximately one-third of the area of the North Island of New Zealand is formed from soft sedimentary rocks of Tertiary age. The geological setting of these soft rocks is outlined, together with some aspects of their engineering geology. A brief description is given of an active landslide which continues to affect the North Island Main Trunk Railway. A more detailed description is given of a 25 m deep cutting and a 50 m high railway embankment currently under construction. Questions raised include an apparent discrepancy between the (low) strengths measured in the laboratory on sieved recompacted sandstones/siltstones, and the satisfactory performance of existing embankments.

Presented at the 2nd Australia-New Zealand Conference of Geomechanics in Brisbane, Australia, July 21-25, 1975.

Hawley, JG *Institution of Engineers (Australia) Natl Conf Pub Conf Paper No. 75/4, 1975, pp 201-206, 15 Ref.*

ACKNOWLEDGMENT: EI

ORDER FROM: Institution of Engineers (Australia), Science House, Gloucester and Essex Streets, Sydney, Australia

00 148817

**USE OF THE THEORY OF RELIABILITY IN RAILWAY BRIDGE DESIGN [O primenenii teorii nadezhnosti v rascetah zeleznodoroznyh mostov]**

As a basic criterion of reliability, it is proposed to apply the probability of failure-free service for bridges. The article gives a classification of types of bridge failure, and recommendations for a quantitative assessment of criteria, as to their reliability when designing the structure. [Russian]

Necaev, JP *Vestnik Vniizt* Vol. 35 No. 6, 1976, pp 47-49, 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 148826

**CONSTRUCTION WORK IN RAILWAY TUNNELS ON THE DB [Bauarbeiten an Eisenbahntunneln der Deutschen Bundesbahn]**

The author discusses recent methods of tunnel maintenance, repair and renewal, with special emphasis on such operations as injection under pressure, draining of inner surface of tunnels, jointing of the masonry and concrete injecting. A special chapter is devoted to the relationship between tunnel work and the organization of rail transport operations. [German]

The article is continued on pp 364-371 of this issue.

Spang, J *Eisenbahningenieur* Vol. 27 No. 8/9, Aug. 1976, pp 307-312, 9 Fig., 12 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Dr Arthur Tetzlaff-Verlag, Niddastrasse 64, Frankfurt am Main, West Germany

00 149009

**LONDON TRANSPORT'S FLEET LINE PROJECT**

The author describes the works involved in the first stage of London Transport's \$80 million Fleet Line project of which the civil engineering construction is now substantially complete. In addition to the difficulties of fitting in with and connecting to London's existing underground railway lines, the author describes how above-ground structures, such as the Queen Eleanor Memorial at Charing Cross, were supported while the work was under way.(a) /TRRL/

Mead, DR *Tunnels and Tunnelling* Vol. 8 No. 7, Nov. 1976, pp 35-39, 5 Fig., 4 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 223681)

ORDER FROM: ESL

DOTL JC

00 149378

**SERVICE LOAD AND FATIGUE TESTS ON TRUSS BRIDGES**

With the construction of the Saylorville Dam and Reservoir on the Des Moines River in Iowa, six highway bridges were scheduled for removal. Two of these were incorporated into a comprehensive test program to study the behavior of old pin-connected high-truss single-lane bridges. The test program consisted of ultimate load tests, service load tests, and a supplementary static and fatigue testing program of selected members. The results reported in this paper cover the service load tests on the two bridges as well as the supplementary tests, both static and fatigue, of eyebar members taken from the two bridges at the time of removal. The field test results of the service loading are compared with theoretical results of the truss analysis.

Elleby, HA Sanders, WW, Jr Klaiber, FW Reeves, MD *ASCE Journal of the Structural Division* Vol. 102 No. ST12, Proc. Paper 12625, Dec. 1976, pp 2285-00

ACKNOWLEDGMENT: ASCE

ORDER FROM: ESL

DOTL JC

00 149386

**THE RIGIDITY OF BRIDGES ON HIGH-SPEED RAILWAY LINES**

The rigid route elements of a high-speed railway line in the Mittelgebirge region necessitated the construction of a large number of tunnels and bridges. Since the DB had hitherto not used the modern viaduct form with high flexible columns with many spans of the same length, this brought new problems, including those of vehicle movement on such structures. The latter are discussed here. A new feature is the consideration of the overall vehicle/track/bridge system. Study of the problem is assisted by a computer programme developed in the last few years by the DB's Central Office for Operation Management and Data Processing. This was originally used for calculating dynamic stresses in railway bridges, and is described here for the first time. A more detailed examination of the subject is included in a research project of the Federal Ministry of Research which considers irritation for the yard personnel and nuisance for people living in the neighborhood, especially at night, and calls for effective noise abatement measures. [German]

Sonntag, PE Streese, D *Eisenbahntechnische Rundschau* Vol. 25 No. 10, Oct. 1976, 7 pp

ACKNOWLEDGMENT: British Railways

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

DOTL JC

00 149405

**REALISTIC DETERMINATION OF OPERATIONAL STRENGTH FOR STEEL RAILROAD BRIDGES [Realistischer Betriebsfestigkeitsnachweis fuer Staehlerne Eisenbahnbruecken]**

Calculations of operational load, fatigue, and equivalent stress are given, and requirements for safety coefficients are determined. [German]

Herzog, M *Stahlbau* Vol. 45 No. 10, Oct. 1976, pp 316-319, 6 Ref.

ACKNOWLEDGMENT: EI

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00 149431

**DRYING OUT THE TRACK BED BY DEEP DRAINAGE [Odwadnianie podtorza za pomoca wglebnego drenazu]**

No Abstract. [Polish]

Skrzynski, E *Przeglad Kolejowy Drogowy* Vol. 23 No. 9, Sept. 1976, pp 22-23, 3 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 149897

**CHANGES IN VOLUME OF SOIL AFTER REPEATED FREEZING AND THAWING [Volymfoeraendringar hos jordarter efter upprepad frysning och tining]**

The report describes model tests performed to obtain the magnitude of the net increase in volume following freezing-thawing cycles. Soils of varying composition were studied. Characteristic soil properties, such as distribution of grain size, capillarity, maximum dry density, mineralogical composition and shape of particles were determined at the beginning and the end of the tests. The soil samples were compacted in cylinders and the freezing was obtained by refrigeration plates on the upper surfaces. Capillary suction of water was made possible from a water level retainer. Temperatures and volumes were registered continuously. The samples were compacted to various dry densities and during the tests the loading on the sample was corresponding to that of the upper strata pressure found in naturally stratified soil or at a depth of one metre in a fill. Fine-grain soil proved to have a greater increase in volume than coarse-grain soil. Other factors resulting in a greater increase in volume were: larger content of clay, high degree of compaction and non-spherical shape of particles. The rate of freezing had no effect on the final outcome. Fine-grain sedimentary soils often had a net increase of volume exceeding 10%, while sandy silty moraine had 3-5%. /TRRL/ [Swedish]

Hedberg, D

Stockholm University, Sweden Monograph 1976, 109 pp, Figs., 9 Tab., Refs.

ACKNOWLEDGMENT: National Swedish Road &amp; Traffic Research Institute (VTIN40024E), TRRL (IRRD-223987)

ORDER FROM: Stockholm University, Sweden, P.O. Box 6701, S-11385 Stockholm, Sweden

00 149960

**MAKING TUNNELS WATERTIGHT [Schutz der Tunnel gegen das Eindringen von Wasser]**

The author summarizes knowledge in this area on the basis of methods and experience in the USSR. [German]

Marnosow, EM *Signal und Schiene* Vol. 20 No. 9, Sept. 1976, pp 317-320, 3 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 149965

**CALCULATION OF THE THICKNESS REQUIRED FOR THE BALLAST LAYER TAKING ACCOUNT OF THE RESISTANCE QUALITIES OF THE TRACK BED [Rascet tolscin] ballastnogo sloja s ucetom svojstv grunta zemljanogo polotna]**

No Abstract. [Russian]

*Vestnik Vniizt* Vol. 35 No. 7, 1976, pp 45-48, 3 Fig., 1 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 149992

**OPTIMUM CHOICE OF DETERMINATE METHODS UNDER MULTIPLE LOADS**

An algorithm for choosing the least-weight statically determined configuration of a given truss under two loading conditions is presented. The procedure is based on modifying the optimal truss, under the same conditions. This latter truss is, in general, indeterminate statically and can be easily obtained, using a decomposition method briefly reviewed in the paper. At every cycle of the procedure one bar (or more) is eliminated, thus yielding an optimal truss with a lower degree of indeterminacy, until the final solution is reached. The relationship between this method and an interactive fully-stressed design procedure is examined, and an example is given. The topology of the problem is covered in an appendix. Extension to more than two loading conditions is suggested. Besides the merits of statically determinate trusses in certain structures and conditions, the least-weight truss and least-weight determinate truss provide useful bounds on the truss weight and can be used as criteria for efficient design.

Lev, OE *ASCE Journal of the Structural Division* Vol. 103 No. ST2, Proc. Paper 12739, Feb. 1977, pp 391-403

ACKNOWLEDGMENT: ASCE

ORDER FROM: ESL

DOTL JC

00 149995

**ARTILLERY FIRE HELPS WIN RAIL'S WAR AGAINST WINTER**  
Snow-fighting is a major expense for railways--Canadian Pacific has allocated \$10 million in 1976/77 for snow-fighting operations nationwide. Around Revelstoke, B.C., CP uses military artillery to blast potential avalanches from the Rocky Mountain slopes from December to April. A specially designed locomotive operating on a continuous basis is used for track clearing. Top priority is also given to keeping lines open in the busy Montreal Corridor which receives an average 120 inches of snow.

*Canadian Transportation & Distribution Management* Vol. 80 No. 2, Feb. 1977, pp 43-44, 1 Phot.

ACKNOWLEDGMENT: CNR

ORDER FROM: Canadian Transportation &amp; Distribution Management, 1450 Don Mills Road, Don Mills, Ontario, Canada

DOTL JC

00 150546

**EXCAVATION TECHNOLOGY: PUBLICATIONS FROM THE RANN PROGRAM, BIBLIOGRAPHY**

This bibliography contains citations of documents received by the National Science Foundation from research supported by the RANN (Research Applied to National Needs) program relating to Excavation Technology. There are 97 bibliographic entries cited. Two indexes follow the main entry section: (1) Performing Organization Index; and (2) RANN Number Index. Availability information for each document is also included.

Capital Systems Group Incorporated, National Science Foundation Bibliog. NSF/RA-760079, May 1976, 28 pp

Contract NSF-C1035

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-260497-3ST, DOTL NTIS

00 150689

**FINITE ELEMENT TECHNIQUES IN ROCK MECHANICS**

During the rapid advance of the electronic computer as a useful tool in engineering analysis, many methods have been developed that take advantage of the computer's ability to rapidly perform large amounts of detailed calculation. One now well-established concept for the stress analysis of plane stress systems in the theory of elasticity is to approximate the real, continuous system as one composed of discrete elements, interconnected in some fashion--hence, the finite element technique. Although the method itself is in an advanced state of development in plane stress analysis, little has been accomplished as yet in applying the method to real problems in rock mechanics. (Author)

Distribution limitation now removed.

Blakey, LH

Department of the Army 1968, 13 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

AD-837103/1ST, DOTL NTIS

00 151745

**PROCEEDINGS: SEMINAR ON UNDERGROUND CONSTRUCTION PROBLEMS, TECHNIQUES AND SOLUTIONS HELD AT CHICAGO, ILLINOIS ON OCTOBER 20-22, 1975**

The seminar on "Construction Problems, Techniques and Solutions" held at the First Chicago Center in Chicago on October 20-22, 1975, was organized to focus on anticipated construction problems of the Chicago Central Area Transit Project to include underground construction techniques, new technology, ground engineering techniques (underpinning, dewatering, grouting), and involved an exchange of experiences among owners, design teams, contractors, and other pertinent agencies. Because of the continuing requests for seminar materials 19 papers prepared for the seminar follow in their entirety. The authors are identified by their titles and associations as of October 1975. Additionally, a complete summary of the panel discussion held during the last afternoon of the seminar and moderated by Mr. Nelson, CUTD Executive Director, is furnished because of the pertinent views that were expressed therein.

Barnes, WL Xanthakos, PP

Chicago Urban Transportation District, Urban Mass Transportation Administration, Transportation Systems Center UMTA-MA-06-0025-76-8, Dec. 1976, 438 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264027/4ST, DOTL NTIS

00 151779

**CONSTRUCTION MONITORING OF SOFT GROUND TUNNELS: A RATIONAL HANDBOOK OF PRACTICES FOR RAPID TRANSIT SYSTEM PLANNERS AND MANAGERS**

This report aims to fit the objectives of the Urban Mass Transportation Administration (UMTA) Tunneling Program--to lower subway construction costs and to reduce construction hazards and damage to the environment. This report generated from an UMTA sponsored study that disclosed the art of instrumentation and monitoring as being advanced but not as

potentially sufficient on tunneling projects. One of the main reasons for this stemmed from a lack of general procedures and guidelines, as well as, a lack of expertise among decision-makers regarding tunnel monitoring. UMTA commissioned this Handbook to remove such difficulties. The principal purpose of this Handbook is to encourage and improve the use of monitoring for urban mass transit tunnels, and other deep excavations. This Handbook documents the findings of a recent UMTA construction monitoring instrumentation research project. The Handbook is directed to systems planners and managers and points out how to incorporate a successful monitoring program(s) into their systems that help to control and reduce costs.

Schmidt, B  
Parsons, Brinckerhoff, Quade and Douglas, Inc, Urban Mass  
Transportation Administration, Transportation Systems Center Hand-  
book UMTA-MA-06-0025-77-1, Jan. 1977, 70 pp

Contract DOT-TSC-661

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264361/7ST, DOTL NTIS

00 151855

**EMBANKMENT SUPPORT FOR KANSAS TEST TRACK.  
ANALYSIS OF EMBANKMENT INSTRUMENT DATA**

Static and dynamic data collected from the embankment instrumentation at the Kansas Test Track are summarized in this report. The static data included permanent horizontal and vertical deformation measurements, moisture contents, and temperatures taken at intervals between the end of embankment construction in Fall 1971 to the opening of the track for traffic in October 1974. Data were also collected through April 1975 after the track was opened to traffic. Dynamic instrument response was measured at three periods between October 1974 and April 1975. The dynamic data include horizontal and vertical deformations and embankment pressure under traffic loads. The static and dynamic response and performance of each test section are analyzed, and the results are summarized.

See also RRIS 01 043234 and 00 039260, Bulletin 7301.

Dietrich, RJ Salley, JR  
Shannon and Wilson, Incorporated, Federal Railroad Administration  
Final Rpt. FRA/ORD-76/258, Dec. 1976, 126 pp

Contract DOT-FR-54168

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264403/7ST, DOTL NTIS

00 152401

**A NEW SOLUTION FOR SUB-BALLAST LAYERS ON RAILWAY  
LINES: AN ASPHALT CONGLOMERATE. CALCULATION OF  
DIMENSIONS USING DYNAMICS [Il conglomerato bituminoso  
come nuova soluzione per lo strato di sottoballast nelle linee ferroviarie.  
Dimensionamento con metodo dinamico]**

An asphalt conglomerate was used as an alternative to a concrete mixture for the sub-ballast layer on the first and fourth sections of the new Rome-Florence Direttissima because it has a number of advantages as regards fatigue strength, self-repair properties, waterproofing and resistance to frost. A special calculating process was used to determine the thickness of the layer; it takes account of the dynamic modules of the materials used and can be checked by tests on site. [Italian]

Celard, B *Ingegneria Ferroviaria* Vol. 31 No. 4, Apr. 1976, pp 3-11, 15  
Phot., 9 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

00 152407

**STRESSES AND SERVICE LIFE OF RAILWAY BRIDGES WITH  
ORTHOTROPIC SLABS [Etat des contraintes et duree de vie des  
ponts-rails a dalle orthotrope]**

Mathematical evaluation of the service life and fatigue strength of the lower flange of a steel railway bridge with four 210 m spans; calculation of the stress distribution and maximum values for stresses at critical points (welded

joints, stiffeners, etc); comparison of these values with results obtained on test pieces. [French/English]

Darvas, E *Welding in the World/Le Soudage dans le Monde* Vol. 14 No. 7/8, 1976, pp 180-187, 9 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

00 152418

**TRACKS WITH LONG-WELDED RAILS ON METAL BRIDGES  
[Besstykovo] put' na metaliceskih mostah]**

Examination of the behavioural characteristics of track with long welded rails on metal bridges, for different methods of fixing girders on bridge structures. [Russian]

Pomogaev, PE *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 45-50, 4 Fig., 2 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 152598

**\$1 BILLION SUBWAY BORES 9.7 MILES BENEATH BUSTLING  
CITY**

The method described permitted the bulk of excavation to be completed quickly so tunneling from the site could begin before the station walls were in place. A hydraulic shield was used to drive the tunnels 2300 ft to the next station. Hard granite in other tube sections, however, required blasting. The line generally lies at a depth of 82 to 115 ft and along a maximum 3% grade.

*Engineering News-Record* Vol. 197 No. 26, Dec. 1976

ACKNOWLEDGMENT: EI (EIX770300100)

ORDER FROM: ESL

DOTL JC

00 152599

**LARGE BORED PILES FOR THE SUBSTRUCTURE OF A  
RAILROAD BRIDGE [Grossbohrpfahle fuer den Unterbau einer  
Eisenbahnbruecke]**

Special practical, static and construction-technological requirements, posed by the method of construction without an excavation, that called for utilization of special structural capacity of the foundations and substructures for the installation of pile walls are discussed. [German]

Niemsch, H (Deutsch Reichsbahn, Berlin, East Germany); Robinski, G  
*Bauplanung-Bautechnik* Vol. 30 No. 9, Sept. 1976, pp 444-447, 4 Ref.

ACKNOWLEDGMENT: EI (EIX770300056)

ORDER FROM: ESL

00 152600

**AUTOMATIC TELEMETERING SYSTEM FOR PLOTTING  
TUNNEL SECTIONS [Sistema telemetrico automatico per il rilievo di  
sezioni di galleria]**

The development of new railways, especially designed for high speed, characterized by long sections in tunnel and the computerized management of the traffic of goods exceeding the loading gage, required the availability of an automatic device for plotting the structure gage along the lines. A prototype, fully designed and constructed by the Istituto Sperimentale of Italian State Railways, which has already proved quite satisfactory during the tests of some tunnels on the new line between Rome and Florence is described. Owing to this, Italian Railways have undertaken the construction in a small series of a motor truck for telemetric plottings, in which some improvements have been introduced. [Italian]

Giovanardi, G (Istituto Sperimentale FS, Rome, Italy); Feigusch, G  
*Elettrotecnica* Vol. 63 No. 11, Nov. 1976

ACKNOWLEDGMENT: EI (EIX770300096)

ORDER FROM: ESL

00 152602

**PRODUCTION OF A LARGE PATTERN SYSTEM (QUALITY M1) FOR TUNNEL RING SEGMENTS [Herstellung einer Grossmodelleinrichtung der Gueteklasse M1 fuer Tunnelringsegmente]**

The details of the design and production of patterns for casting subway tunnel ring segments in cast iron are described and illustrated. The patterns are expected to be used for 20,000 castings without major repairs. [German]

Eppstein, H *Giesserei* Vol. 63 No. 21, Oct. 1976

ACKNOWLEDGMENT: EI (EIX770300111)

ORDER FROM: ESL

00 152621

**EARTHWORKS IN MODERN RAILWAY AND ROAD CONSTRUCTION**

Earthworks are works which most frequently, in view of their inadequacy, bring about situations such as not to allow speed levels, which had been fixed as an objective, to be reached without the weight of very considerable maintenance costs. It can thus be affirmed that these are the works which qualify a modern railway line. Economies in this sector can only represent a modest quota of the total cost of a railway and thus represent a serious mistake. It being understood that to obtain good results from road and railworks, and to avoid serious unexpected difficulties, and the consequent considerable delays and increased costs in the executive phase, it is necessary to carry out a rational programme of surveys of the terrain during this phase, an illustration is given in this first article of the various phases of the geological and geotechnical surveys. [Italian]

Orlandi, D *Ingegneria Ferroviaria* Vol. 31 No. 9, Sept. 1976, pp 7-13

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

00 152623

**BRIDGES THAT ARE SLID IN PLACE UNDER THE TRACK...****[Des ponts que l'on glisse sous les voies...]**

Two examples (a road tunnel under the Metz-Thionville line and an underpass for light vehicles under the Tours-Saint-Nazaire Line) are used to illustrate this new technique for building and installing tunnels under railway lines where there need be no stop to the flow of traffic; the tunnel is prefabricated alongside the track and then pushed or pulled into its final place. [French]

Schontz, A *La Vie du Rail* No. 1577, Jan. 1977, pp 11-14, 1 Tab., 17 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: French National Railways, 610 Fifth Avenue, New York, New York, 10020

00 152633

**ANALYSIS OF DAMAGE TO RAILWAY STEEL BRIDGES****[Analyse der Schaeden an Staehlernen Eisenbahnbruecken]**

No Abstract. [German]

Pohlschmidt, M *Signal und Schiene* Vol. 20 No. 11, Nov. 1976, pp 388-393, 1 Tab., 18 Phot., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 152668

**ELEVATED STRUCTURE FOR ATLANTA TRANSIT SYSTEM**

A standardized elevated structure for above-ground segments of the Metropolitan Atlanta Rapid Transit system was designed primarily for installation with adequate clearance on railroad rights-of-way and also as a low-profile aerial guideway which would be aesthetically suitable in residential neighborhoods. The concept involves a prestressed concrete deck slab acting compositely with single box girders supported on rectangular concrete columns. Various sound-deadening arrangements have been part of the structural design.

*Railway Track and Structures* Vol. 73 No. 2, Feb. 1977, pp 17-19, 2 Phot.

ORDER FROM: ESL

DOTL JC

00 152697

**ESTIMATING THE COST OF TUNNELLING IN ROCK**

Assuming a tunnel length of 3050 m, horseshoe shape, watertight concrete lining, and groundwater elevation 15 m above the tunnel invert, the author developed cost curves for drilled-and-blasted tunnels and for machine tunneling. These curves can be adapted to tunnels with other parameters to estimate tunneling costs.

Wheby, FT *World Construction* Vol. 29 No. 11, Nov. 1976, 2 pp

ACKNOWLEDGMENT: EI (EIX770200190)

ORDER FROM: ESL

00 152779

**MECHANICS OF THE IMPULSIVE WATER CANNON**

An impulsive water cannon is a machine for converting low to high power kinetic energy. Specifically, a column of liquid is accelerated to moderate velocity by direct application of gas pressure, or via the action of an intermediate free piston, and is then directed into a converging nozzle of appropriate design. The function of the nozzle is to redistribute the initially more or less uniform energy content of the column such that a small mass fraction of the forward or leading end contains, at discharge, essentially all the energy. The jet stagnation pressure thus derived can be many times the strength of even the hardest rock materials and can thus serve as a useful tool for excavation, tunneling, mining and a variety of other industrial applications. A model is proposed to describe the operating characteristics of the impulsive water cannon. The important parameters governing the system dynamics are identified and the influence of these on performance is studied with the aid of a unique finite-difference code. The algorithm upon which this code is based is described as are its principal features. The results of the calculations are compared with recently developed incompressible theory and with experiment.

Glenn, LA (Institut CERAC, Ecublens, Switzerland) *Computers and Fluids* Vol. 3 No. 2/3, June 1975, pp 197-215

ACKNOWLEDGMENT: EI (EIX770200027)

ORDER FROM: ESL

00 152808

**WASHINGTON METRO'S TOPLESS TUNNELS**

Soil investigations for a section of the Metro where existing major highway and bridge structures would leave relatively little cover over the tunnels revealed that the tunnels would have to be driven through mixed face, with a clay invert and a waterlogged sand crown. Thus, there was a good chance that the roof would fall in. The design settled on a scheme of grout injection to stabilize the granular soils and preclude the development of runs in the crown of the tunnel headings. Combined with careful tunneling, it was felt that this would be sufficient to maintain both safety and decorum. The paper discusses the construction planning, design provisions, grouting program, equipment and methods, problems and costs.

Presented at the 3rd Rapid Excavation &amp; Tunneling Conference, Las Vegas, Nevada, 14-17 June 1976.

Kuesel, TR (Parsons, Brinckerhoff, Quade and Douglas, Inc)

American Inst of Mining, Metallurg &amp; Petrol Engrs Conf Paper 1976, pp 296-310

ACKNOWLEDGMENT: EI (EIX770200129)

ORDER FROM: American Inst of Mining, Metallurg &amp; Petrol Engrs, 345 East 47th Street, New York, New York, 10017

00 152809

**SELECTION OF THE VERTICAL ALIGNMENT OF RAPID TRANSIT TUNNELS**

The paper presents an abbreviated view of factors that influence selection of vertical alignment of rapid transit tunnels in an urban setting. The two principal factors relating to pre-existing site conditions are the geological setting and the impact of tunneling on adjacent structures. However, a wide variety of other influences makes itself felt, which includes geometric criteria based on train operations, overall route interaction, environmental and public policy considerations, and finally the total economic appraisal.

Presented at the 3rd Rapid Excavation &amp; Tunneling Conference, Las Vegas, Nevada, 14-17 June 1976.

Daugherty, CW (De Leuw, Cather and Company); Ware, KR Gould, JP  
American Inst of Mining, Metallurg & Petrol Engrs Conf Paper 1976, pp 311-331

ACKNOWLEDGMENT: EI (EIX770200130)  
ORDER FROM: American Inst of Mining, Metallurg & Petrol Engrs, 345 East 47th Street, New York, New York, 10017

**00 152810**  
**AS-BUILT GEOTECHNICAL REPORT: ITS USE FOR DESIGN OF SUPPORT FOR THREE ROCK STATIONS, WASHINGTON, D. C. METRO**

The three rock station areas have been explored by crown pilot tunnels and an as-built report, with geologic maps and sections, has been prepared for use by the design engineer as the basis of design for support of the structures. The geotechnical report describes the geologic structure in detail and relates it to excavation and support of the three crown pit tunnels and the running tunnels which will be enlarged to create the stations. The information was complete enough to permit the design engineer to visualize the geologic structure, compute loads for the various types of rock conditions, and design the steel set supports.

Presented at the 3rd Rapid Excavation & Tunneling Conference, Las Vegas, Nevada, 14-17 June 1976.

Bock, CG (Bechtel Corporation)  
American Inst of Mining, Metallurg & Petrol Engrs Conf Paper 1976, pp 430-447

ACKNOWLEDGMENT: EI (EIX770200132)  
ORDER FROM: American Inst of Mining, Metallurg & Petrol Engrs, 345 East 47th Street, New York, New York, 10017

**00 152811**  
**CONSTRUCTION CONTROL INSTRUMENTATION USED DURING TUNNEL ENLARGEMENT**

A geotechnical instrumentation program consisting of borehole extensometers and portable tape extensometer stations was effectively used to monitor concrete liner deformations and guide construction procedures during enlargement of a 75-year old Union Pacific Railroad tunnel in Wyoming. Enlargement involved excavation of the old concrete invert and placement of 5,941 ft of new concrete invert 6 ft lower in squeezing shales, fault zones and water-bearing sandstones. Instrumentation data were used to guide procedures for excavating the old invert, installation of temporary interior struts, underpinning existing liner walls, and placing the new concrete invert.

Presented at the 3rd Rapid Excavation & Tunneling Conference, Las Vegas, Nevada, 14-17 June 1976.

Robinson, RA (Shannon and Wilson, Incorporated); Miller, RP Monson, DL  
American Inst of Mining, Metallurg & Petrol Engrs Conf Paper 1976, pp 742-758

ACKNOWLEDGMENT: EI (EIX770200137)  
ORDER FROM: American Inst of Mining, Metallurg & Petrol Engrs, 345 East 47th Street, New York, New York, 10017

**00 152812**  
**TRANSPORTATION TUNNELING DEMAND, PRESENT AND FUTURE**

Currently, the two major types of transportation tunnels being constructed are highway and rail transit. The technological and institutional improvements which are needed in order to reduce capital construction costs can be achieved by an effective Federal research and development program which is responsive to the industry needs. A responsive R&D program should be based on clearly defined cost benefit ratios; hence demand forecasting is an integral part of the R&D activity. Demand studies can also provide guidance to policy makers in all sectors of the tunneling industry, such as the needed capacity of the industry to meet projected construction. How much the increase in tunneling might be through the 1980's is the subject of the paper.

Presented at the 3rd Rapid Excavation & Tunneling Conference, Las Vegas, Nevada, 14-17 June 1976.

Butler, GL (Urban Mass Transportation Administration); Wilkes, W  
American Inst of Mining, Metallurg & Petrol Engrs Conf Paper 1976, pp 774-793, 11 Ref.

ACKNOWLEDGMENT: EI (EIX770200138)  
ORDER FROM: American Inst of Mining, Metallurg & Petrol Engrs, 345 East 47th Street, New York, New York, 10017

**00 152813**  
**EUROPEAN STABILIZATION PRACTICE USING CHEMICAL SYSTEMS IN URBAN TUNNELING**

Injection stabilization as an aid to tunneling is practiced extensively in Europe and its use is increasing in the United States. The advantages of this technique over conventional solutions can be substantial in cost terms and time. The paper discusses European practices in terms of grouting techniques, costs, the reasons for grouting, philosophy of the users towards grouting, design of grouting solutions and methods of quality control. Differences with U.S. grouting practices are also noted.

Presented at the 3rd Rapid Excavation & Tunneling Conference, Las Vegas, Nevada, 14-17 June 1976.

Clough, GW (Stanford University)  
American Inst of Mining, Metallurg & Petrol Engrs Conf Paper 1976, pp 809-831, 10 Ref.

ACKNOWLEDGMENT: EI (EIX770200139)  
ORDER FROM: American Inst of Mining, Metallurg & Petrol Engrs, 345 East 47th Street, New York, New York, 10017

**00 152823**  
**TOWARDS AN ABSOLUTE MEASUREMENT OF SOIL STRUCTURAL STABILITY USING ULTRASOUND**

Calibrations enabled controlled application of a range of known dispersive energies to a selected soil sample. The corresponding levels of dispersion were measured in terms of the weight fraction of particles smaller than 2 mu-m equivalent spherical diameter produced, and are used to define a dispersion characteristic for the test soil. Interpretation of this characteristic in terms of a microaggregate theory provides the energy value associated with complete "primary dispersion" of microaggregates, which under normal field conditions is a direct practical measure of soil stability. This leads to a definition of the specific stability index of a soil. /TRRL/

North, PF (Rothamsted Experimental Station) *Journal of Soil Science* Vol. 27 No. 4, Dec. 1976, pp 451-459, 2 Fig., 21 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 224412)  
ORDER FROM: Oxford University Press, Press Road, Neasden, London NW10 0DD, England

**00 153066**  
**CONSIDERATIONS IN THE ANALYSIS OF CONVENTIONAL RAILWAY TRACK SUPPORT SYSTEMS**

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 model. 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 structural model was used to study the effects of major design parameters on the response of the CRTSS.

This doctoral dissertation was announced in Dissertation Abstracts International B: The Sciences and Engineering, Vol. 37, No. 1 (July 1976), p 375-B. See also by same Author RRIS 01 133229, 01 148272-274, all Bulletin 7701, on CRTSS.

Tayabji, SD  
Illinois University, Urbana Dissertatn 1976, 166 pp, 47 Fig., 27 Tab., 63 Ref.

ACKNOWLEDGMENT: Illinois University, Urbana  
ORDER FROM: University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48103

Order No. 76-16,205, DOTL RP

00 153404

**THE RAPID MEASUREMENT OF THE MOISTURE CONDITION OF EARTHWORK MATERIAL**

This Report describes the development of a test for the rapid measurement of the moisture condition of earthwork material. It is suggested that the method be considered for use in construction control to assess the suitability of materials in relation to the specified upper limits of moisture content, while avoiding the measurement of moisture content with its associated delays. It could also be used to provide a moisture condition parameter for correlation with the engineering behaviour of soil. The test method is based on the principles of compaction whereby the curves relating bulk density to moisture content tend to converge at moisture content values which depend on the compactive efforts used. The apparatus developed for the test is described and the results of calibrations of the apparatus on a range of soil types are given. The results indicate that a single criterion of control could be applied with the proposed test regardless of variations in soil type.

Parsons, AW

Transport and Road Research Laboratory Lab. Rpt. 750, 1976, 12 pp, 15 Fig.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: TRRL

00 153405

**BRIDGE TEMPERATURES DERIVED FROM MEASUREMENT OF MOVEMENT**

Movements were measured at expansion joints in 7 bridges of various forms of construction and were transformed into corresponding values of effective bridge temperatures. Correlation was established between these effective temperatures and the sum of the mean shade temperature of the five previous days and an appropriate proportion of the daily range of effective bridge temperature. From this, both the annual range and instantaneous values of effective bridge temperature can be determined. The method also enables statistical estimates to be made of the range of effective bridge temperature for various return periods. The influence of bridge exposure, geographical location and bridge form on effective bridge temperatures are also discussed.

Black, W

Transport and Road Research Laboratory Lab. Rpt. 748, 1976, 33 pp, Figs.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: TRRL

00 153407

**BUCKLING OF THIN-WALLED CYLINDRICAL SHELLS IN SOIL**

The work consists of a theoretical derivation of the buckling equations of a thin-walled cylindrical shell supported by an elastic medium. A buckling pressure is predicted that is a function of the one-third power of shell stiffness parameter and a two-third power of soil-stiffness. Consideration is given to how a proper elastic modulus for the soil should be chosen and the influence of that choice upon theoretical predictions. Comparison with experimental evidence shows that the proposed theory predicts the trend of the data but is inaccurate in magnitude. However, such errors can be explained by the lack of detailed information reported in the literature on the actual state of stress in the soil in relation to the test results. Without this information, the choice of parameters is uncertain and may to some extent account for the difference between theory and experimental results. A design formula is suggested which is obtained by empirically relating an oedometer test secant modulus to an apparent minimum tangent modulus for sand. Future work must be directed toward a proper evaluation of stress state in soil surrounding a shell and the appropriate constitutive law for soil characterization.

Chency, JA

Transport and Road Research Laboratory Supp. Rpt. 204, 1976, 15 pp, 2 Fig.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: TRRL

00 153794

**CONSOLIDATION WORK ON THE VAL-DES-ESCHOLIERS CUTTING [Travaux de confortement de la tranchée du Val-des-Escholiers]**

A high chalk ridge rises above the Val-des-Escholiers cutting on the Mulhouse-Paris up line and falling rocks can be a serious danger for passing trains. Various protection systems have been tried without giving absolutely satisfactory results. The solution adopted has been to build a reinforced earth wall. This wall is formed of earth and galvanized steel bracing with strips 60-80 mm thick; the parts away from the track stand free while the parts towards the track have a reinforced concrete casing. [French]

Odds, P (French National Railways) *Revue Generale des Chemins de Fer* Feb. 1977, pp 103-106, 4 Fig., 4 Phot.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

00 153798

**WEED CONTROL ON RAILWAYS**

Chemicals may be contact, for quick killing, foliage or root absorbed, depending whether treatment is to be selective but preventing brushwood and readily inflammable foliage developing.

Hernandez, TJ *Railway Engineer* Vol. 2 No. 2, Mar. 1977, pp 44-45, 2 Fig.

ACKNOWLEDGMENT: Railway Engineer

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

DOTL JC

00 153969

**SYSTEMS STUDY OF PRECAST CONCRETE TUNNEL LINERS**

The study addresses precast concrete lining systems. Existing precast concrete systems designed or constructed in Europe, Japan, and the United States are evaluated. With these as a point of departure, designs for lining systems applicable to the specific conditions encountered in the United States are developed. A comparative cost analysis is made between the linings designed in the study, one existing precast concrete design and two in fabricated steel. Appreciably lower costs are found for all of the concrete liner designs when compared to those in fabricated steel. Water sealing systems are discussed and recommendations for the development and testing of sealing details are made. Guidelines for dissemination of information about, and for the implementation of the systems, are presented.

Sponsored in part by Department of Transportation, Washington, D.C. Office of the Secretary, and Urban Mass Transportation Administration, Washington, D.C.

Birkmyer, J

Bechtel Corporation, Transportation Systems Center, Office of the Secretary of Transportation, Urban Mass Transportation Administration Final Rpt. DOT-TSC-OST-77-7, Mar. 1977, 147 pp

Contract DOT-TSC-772

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264761/8ST, DOTL NTIS

00 154120

**SELF-CONTAINED INSTRUMENT FOR MEASURING SUBTERRANEAN TUNNEL WALL DEFLECTION**

The invention relates generally to apparatus for measuring the amount of deflection of a subterranean tunnel, and more particularly to a completely self-contained rod-like instrument including a deflection measuring transducer, a data storage means, and a visual indicator to an operator.

Supersedes PB-245 369. This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of patent available Commissioner of Patents, Washington, D.C. 20231 \$0.50.

Rasmussen, DE Hof, PJJ

Department of the Interior Patent PAT-APPL-585-223, No Date, 32 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263713/0ST, DOTL NTIS



00 154783

**END CRACKING IN PRESTRESSED MEMBERS DURING DETENSIONING**

This report is concerned with an investigation to determine analytically as well as experimentally the theory that end cracking observed during prestress transfer in pretensioned operations is caused by tensile stress induced by the restraining effect of relatively short length of unbonded cables. Production line prestressed members were monitored for strain increase during detensioning and the castings were measured for elastic shortening. Results were compared with an analytic model capable of furnishing cable strains during any detensioning scheme in a multiple casting operation. Full scale experimental members were designed such that during transfer tensile stress in concrete due to cable restraint would be maximized. Cracks were indeed caused as predicted by analytic calculations. Finally as an example problem, full scale production line girders were monitored for cable strain during detensioning and compared with analytically calculated values.

Sponsored in part by North Carolina Dept. of Transportation and Highway Safety, Raleigh and Federal Highway Administration, Raleigh, N.C. North Carolina Div.

Mirza, JF Tawfik, ME

North Carolina State University, Raleigh, North Carolina Department of Transportation, Federal Highway Administration, (HPR) Final Rpt. ERSD-110-75-6, FHWA/ERSD-110-75-6, July 1976, 86 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265603/1ST, DOTL NTIS

00 154798

**AN INVENTORY OF FUTURE TRANSIT SUBSURFACE CONSTRUCTION**

An inventory of future transit (fixed guideway) subsurface construction in the United States and Puerto Rico was undertaken, covering the 1976-1990 time frame. A total of 19 transit constructing authorities in 17 cities were surveyed by questionnaire and on-site visitations. Information was gathered on status, routes, type of construction, costs, geology, environmental factors, and any other unique factors. A total of over 120 miles of planned construction was revealed, expected to cost over \$7.5 billion, in the survey time period. However, the total is heavily influenced by planned Washington construction. Among other cities about 30 miles is totally funded; the rest is planned but unfunded. Costs of cut and cover are beginning to approach mined tunnel (except in New York), and environmental considerations often swing the balance.

Prepared in cooperation with Urban Mass Transportation Administration, Washington, D.C.

Vaccaro, AP

Transit Development Corporation, Incorporated, Urban Mass Transportation Administration, Office of the Secretary of Transportation Final Rpt. DOT-TST-76-86, June 1976, 109 pp

Contract DOT-OS-60065

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265721/1ST, DOTL NTIS

00 154802

**UNDERGROUND EXCAVATION. AN ANNOTATED BIBLIOGRAPHY**

The bibliography covers all aspects of science, technology, and engineering that relate directly to excavation of underground openings in both soil and rock. The volume lists 600 document citations which contain excavation techniques other than drill-and-blast method. Each document is characterized by its type, originality of data, stage of project completion, excavation techniques, energy application methods, costs, ground conditions, materials handling systems and other operational or physical properties of the tunneling project. Cross-indexed listings provide access via the name of performing organization, funding organization, tunnel names, excavation techniques, authors, etc. Literature sources include journals, both national and international, books and monographs covering a period of 1960 to present. Approximately 60% of the document citations were published in the period 1972-1976.

Judd, WR Von Frese, R Hasan, SE

Purdue University, Office of the Secretary of Transportation Final Rpt. DOT-TST-77-20, Dec. 1976, 164 pp

Contract DOT-OS-60088

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265734/4ST, DOTL NTIS

00 154810

**TRANSPORTATION TUNNELING PROGRAM REVIEW. ANNUAL CONFERENCE (2ND) ON DOT RESEARCH AND DEVELOPMENT IN TUNNELING TECHNOLOGY, HELD AT EASTON, MARYLAND, ON SEPTEMBER 15-17, 1976**

This document contains summaries of all R&D tasks in tunneling technology reviewed at the Second Annual Transportation Tunneling Program Review. The purpose of the conference was to review the U.S. Department of Transportation (DOT) research and development program in tunneling technology. This review was conducted and sponsored by the Office of the Secretary, the Urban Mass Transportation Administration, and the Federal Highway Administration to provide researchers, program managers, R&D staff, and others involved with tunneling technology with an overall perspective of the DOT tunneling R&D program scope, objectives and goals.

Sponsored in part by Virginia Highway and Transportation Research Council, Charlottesville.

Office of the Secretary of Transportation, Virginia Highway & Transportation Research Council DOT-TST-77-22, Nov. 1976, 215 pp

Contract DOT-PS-63044

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265810/2ST, DOTL NTIS

00 156231

**APPLICATION OF WATER JET CUTTING TECHNOLOGY TO THE TUNNEL EXCAVATION**

It is possible to cut and fracture rock with high-speed water jets. Because of the many tunnels planned for extensions of the Japanese National Railways, a tunnel boring machine utilizing water jets is being developed. Grooving of the rock surface with jets prior to fracturing with a cutter or bit is found to speed the penetration rate by 2 to 5 times. Ultimately the goal is a tunneling machine where jets do the major cutting in rock and cutters play this role in soft rock.

Nagano, T Kinoshita, T *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 3, Sept. 1976, pp 97-102, 23 Fig., 1 Tab., 3 Ref.

ACKNOWLEDGMENT: Railway Technical Research Institute, Japan

ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

DOTL JC

00 156337

**NUMERICAL ANALYSIS OF THE MAXIMUM EARTH PRESSURE ACTING ON TUNNEL LINING**

The paper discusses the application of a new analytical method for the direct determination of the maximum earth pressure acting on a tunnel lining and the method follows similar techniques being employed in elastic analysis, although the medium around the tunnel is assumed to be viscoelastic. The time when the lining is installed after excavation is also considered in this proposed method. A brief description of the proposed method is given and the finite element analyses are presented for circular, elliptical, and horseshoe-shaped linings installed in the homogeneous and isotropic underground medium. Numerical results calculated by the finite element method are compared with the analytical solutions, these showing good agreement. The effects of shape and rigidity of the lining and the opening above the lining crown on the earth pressure are discussed.

Presented and discussed at the International Conference on Numerical Methods in Ecomechanics, 2nd, Virginia Polytechnic Institute and State University, Blacksburg, June, 1976.

Sakurai, S (Kobe University, Japan); Yamamoto, Y  
American Society of Civil Engineers Vol. 2 1976, pp 821-833



ACKNOWLEDGMENT: EI (EIX770400419)  
ORDER FROM: ASCE

00 156341

**PRACTICAL EXPERIENCE FROM THE EXCAVATION OF  
SLURRY TRENCHES IN OSLO CLAY**

Subway and railroad tunnel through the center of Oslo where the tunnel walls are constructed by means of the slurry trench method is described. Every 4.5 m crosswise along the tunnels, slurry trenches are excavated and cast with concrete 5 m below the bottom of the tunnels. This contributes both to preventing bottom heave failure and to bracing the tunnel walls. Of the total 31,000 square meters of slurry trench excavated, 18,000 square meters are carried out with only water as slurry, while for the remaining trenches, partly the traditional bentonite slurry and partly a slurry made of clay from the site are used. The stability of the slurry trenches and results of some of the extensive measurements, observations and experience gathered during the execution of the projects are discussed.

Karlsruh, K *Norwegian Geotechnical Institute Publication* No. 110, 1976, pp 39-47, 6 Ref.

ACKNOWLEDGMENT: EI (EIX770400384)  
ORDER FROM: ESL

00 156865

**INVESTIGATIONS START ON RAIL DISASTER**

On January 18, 1977, an inbound commuter train hauled by an electric locomotive derailed in the Sydney suburbs, struck the between-the-tracks steel supports for a street overpass, and then had several of its cars damaged and crushed by the collapsing concrete bridge deck. This was the worst rail disaster in Australian history with 81 killed. While the derailment cause had not been determined, it was agreed that had there been no intermediate piers the bridge would not have fallen. Piers were said not to be designed to take excessive lateral force and the 13 girders under the bridge rested only on brick ledges at the edges of the railway cut. Steps taken to prevent further movement of the fallen bridge deck during rescue operations are described.

*Institution of Engineers (Australia) Journal* Vol. 49 No. 6, Jan. 1977, pp 2-3, 2 Fig., 2 Phot.

ORDER FROM: ESL

00 156871

**TWIN STAYED GIRDERS TO CARRY ECCENTRICALLY  
PLACED RAILROAD**

As part of a 33-km (20-mile) crossing of the twin channels of the Parana River in Argentina, a pair of 1082-m main-span steel-stayed bridges have been erected to carry the four-lane roadway with a single-track railroad at one side which produces unusual dynamic, torsional and asymmetrical loadings. The original concept of through trusses was abandoned in favor of placing the track on top of the trusses. To cope with asymmetrical loads, there are double the number of cables on the rail side and special horizontal torsional bracing. Problems of design, financing and construction are described.

*Engineering News-Record* Vol. 198 No. 6, Feb. 1977, pp 20-23, 6 Fig., 2 Phot.

ORDER FROM: ESL

DOTL JC

00 156876

**MEASURING METHODS IN BRIDGE CONSTRUCTION ON THE  
GERMAN FEDERAL RAILWAYS**

All quantities of importance in the measurement of bridge structures are defined and, where necessary, illustrated mathematically. Exact knowledge of these gives the engineer a full insight into the static and dynamic behavior of a structure, influence of shrinkage stresses on the reliability of a structure, actual load-carrying capacity of a super-structure, slippage in the fasteners. Modern measuring methods make use of a wide range of instruments. The various mechanical and electrical methods are described in detail, and the merits and drawbacks of each group are compared. [German]

Weber, W *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 69-79

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

DOTL JC

00 156891

**THE USE OF BITUMINOUS MATERIALS IN THE  
CONSTRUCTION OF RAIL BEDS [Impiego di materiali bituminosi  
nella sovrastruttura di linee ferroviarie]**

This article reviews some of the problems (water penetration, shifting and breaking of ballast etc.) concerning the maintenance of railway lines, and points out the advantages (better construction and operational characteristics, less maintenance etc.) deriving from the use of bituminous materials in the rail bed. The first important application of this technique in Italy was the construction of a 12 cm-thick sub-ballast layer of close texture bituminous mixture on the first section of the Rome Florence express line in 1975. The optimum design of the new type of rail bed is discussed and the results of laboratory tests (CBR, modulus of elasticity, tensile strength permeability and Marshall stability) carried out on the materials, are shown in tables and graphs. /TRRL/ [Italian]

Zocca, A Puorger, AC Castagnetta, V *Rivista della Strada Analytic* Vol. 46 No. 426, Jan. 1977, pp 57-76, Figs., Tabs., Photos., 12 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-225457)

ORDER FROM: Casa Editrice la Fiaccola, Via Ravizza 62, Milan, Italy

00 156895

**BENDING STRENGTH AND STIFFNESS OF BRIDGE PILES  
AFTER 85 YEARS IN THE MILWAUKEE RIVER**

No Abstract.

Bendtsen, BA  
Forest Products Laboratory, (A 13.79:FPL-0229) Res. Note FPL-0229, 1974, 5 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: Forest Products Laboratory, Department of Agriculture, P.O. Box 5130, Madison, Wisconsin, 53705

00 156898

**SOME ASPECTS OF NATURAL SLOPE STABILITY IN SILT  
DEPOSITS NEAR KAMLOOPS, BRITISH COLUMBIA**

Stability problems, viz. landslides and piping related processes, are examined in the silt deposits of the South Thompson Valley, near Kamloops, B.C. The deposits exist in a comparatively dry state in a semi-arid climate and consist of two main materials: lacustrine silt and colluvium derived from it. Piping and related processes are examined, i.e. piping, collapse and caving. Engineering implications for the siting of buildings and related facilities are discussed.

Presented at the 29th Canadian Geotechnical Conference, Session IV, October 13-16, 1976, in Vancouver, British Columbia.

Evans, SG (British Columbia Department of Highways, Canada);  
Buchanan, RG  
Canadian Geotechnical Society Conf Paper 1976, pp 1-32, 35 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 156900

**BROODSNYERSPLAAS-RICHARDS BAY RAILWAY LINE. A  
DESCRIPTION OF THE RAILWAY WORKS--PLANNING,  
DESIGN AND CONSTRUCTION CONSTRUCTION**

The paper describes the design, planning and construction of the railroad line running from the Transvaal coalfields near Broodsnyersplaas through Ermelo, Vryheid, Ulundi and terminating at Richards Bay, a total route distance of 500 km.

Hill, RD *Civil Engineer in South Africa* Vol. 18 No. 11, Nov. 1976

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

00 157228

**SPAN PLACEMENT DISRUPTS RAIL TRAFFIC ONLY FOUR DAYS**

Delaying train traffic only four days, a contractor removed two spans of a single-track rail bridge, demolished a supporting pier, replaced the two spans with a 400-ft.-long, 1,200-ton steel lift span and laid new track. The lift span was placed in the 14-span bridge at Kennewick, Washington, to accommodate large barge tows.

*Engineering News-Record* Vol. 200 No. 19, May 1977, p 16

ORDER FROM: ESL

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00 157237

**SUBSIDENCE ABOVE SHALLOW TUNNELS IN SOFT GROUND**

The paper investigates the influence of the depth of burial and crown settlement on the surface subsidence above shallow tunnels driven in soft ground. Model tests were conducted on tunnels in sand and in clay, and these are compared with one another and with observations of settlements above some real tunnels. There is good agreement between the model behavior and the field records. The error, or normal probability curve, may be used as an approximation for the trough of surface subsidence, and the standard deviation is an appropriate measure of the width. Empirical relationships exist between the depth of burial, the trough width and the crown and surface settlements for tunnels in sands and in clays.

Atkinson, JH (University College, Wales); Potts, DM *ASCE Journal of the Geotechnical Engineering Div* Vol. 103 No. 4, Apr. 1977, pp 307-325, 21 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

00 157242

**TREATMENT OF ROCK SLOPES ON TRANSPORTATION ROUTES**

The paper reviews the causes of rock falls and methods of dealing with them in North American and European highway and railroad practice. Methods of stabilization, protection and warning are described and illustrated. Some of these methods can be combined for increased safety at a single site. Guidelines are suggested to organize an effective program to guard against rock falls. Steps in planning, deciding on the priority of sites to be treated, and choice of treatment methods at particular sites are discussed.

Presented at the 29th Canadian Geotechnical Conference, Session I, October 13-16, 1976, in Vancouver, British Columbia.

Peckover, FL Kerr, JWG

Canadian Geotechnical Society Conf Paper 1976, pp 14-40, 11 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 157243

**LIMIT EQUILIBRIUM ANALYSIS OF PROGRESSIVE FAILURE IN THE STABILITY OF SLOPES**

A limit equilibrium method of analysis is proposed for the study of progressive failure in slope stability under a long-term condition. Based on effective stresses, the formulation of the method is derived from consideration of force and moment equilibrium within the soil mass above a prospective slip surface. By dividing the soil mass into a number of vertical slices, recognition of local failure can be made. Stability charts have been prepared for design purposes.

Presented at the 29th Canadian Geotechnical Conference, Session VIII, October 13-16, 1976, in Vancouver, British Columbia.

Law, KT (National Research Council of Canada); Lumb, P

Canadian Geotechnical Society Conf Paper 1976, pp 18-34, 19 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 157244

**DESIGN CONSTRUCTION AND PERFORMANCE OF A SLURRY TRENCH WALL NEXT TO FOUNDATIONS**

This paper documents the design construction and performance of a tied-back retaining system constructed by the slurry trench method. The system was necessary to retain the sides of a deep cut in glacial till immediately adjacent to the heavily loaded foundations of historically important and, settlement sensitive structures. The slurry trench and surrounding structures were instrumented using settlement points, crack movement devices, horizontal measurement points, inclinometers and load cells. The soil investigation and design methods adopted are described.

Presented at the 29th Canadian Geotechnical Conference, Session IX, October 13-16, 1976, in Vancouver, British Columbia.

Rosenberg, P St. Arnaud, G Journeaux, NL Vallee, H

Canadian Geotechnical Society Conf Paper 1976, pp 1-25, 11 Ref.

ACKNOWLEDGMENT: EI

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00 157245

**EMBANKMENT FOUNDATION STABILITY USING RESIDUAL STRENGTH**

Three case histories are described which involve the construction of major bridge approach fills on heavily overconsolidated clay or clay-shale foundations, in which the residual strength of the foundation materials governed the design. The case histories are well documented by both field and laboratory observations. The difficulties of detecting thin pre-existing failure planes in overconsolidated foundation materials are described.

Presented at the 29th Canadian Geotechnical Conference, Session X, October 13-16, 1976, in Vancouver, British Columbia.

Insley, AE Chatterji, PK Smith, LB

Canadian Geotechnical Society Conf Paper 1976, pp 1-32, 9 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 157246

**SYSTEMS SAFETY AND TUNNEL SUPPORT**

About 10 years ago a Swiss engineer, John Bernold, designed a tunnel support system that needs three requirements: (1) It seals off rock from the effects of air slacking and water entrainment; (2) It immediately provides a strong temporary support for the miners; (3) All of the steel placed can be used as part of the permanent tunnel support structure. With the Bernold system, shot-crete is supported, and together with the steel plates, has a very high shear strength. This support system, in addition to providing safety for tunnel employees, substantially reduces the work effort, because the need for vast quantities of temporary timber lagging no longer exists; it reduces the amount of steel needed for the permanent support; it eliminates the need for large quantities of concrete to cover a tangle of temporary steel arches and a mat of re-steel. This system can be compared to a thin arch dam, and it reacts to extreme ground forces by flexing to shift the load. A great number of tunnels in Europe have used the Bernold systems safety approach for tunnel support. The St. Gotthard Highway Tunnel through the Swiss Alps is notable for the use of this system. The subways in Tokyo also have used this system to good advantage. The Bernold system has been used in almost 1,000 miles of tunnels, and not one has fallen. It is stated that the Bernold system can easily meet the safety requirements of OSHA, the U.S. Corps of Engineers, and the State of California Tunnel Orders.

MacCollum, DV *National Safety News* Vol. 114 No. 6, Dec. 1976

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 157408

**SYNTHETIC RESIN COMPOSITE CONSTRUCTION AS A NEW CONSTRUCTIONAL SYSTEM FOR UNDERGROUND CAVITIES AND EXCAVATIONS [Der Kunststoff-Verbundverbau als Neuartiges Ausbansystem fuer Hohlräume und Baugruben]**

Synthetic resins, because of their high strength and deformability are very suitable for use in the new Austrian tunnelling method (NATM). Following a brief description of the NATM, the advantages of the epoxy resin anchor bonded to the epoxy resin coating over the shotcrete method are explained. Epoxy resin has a lower  $e$  modulus (lower build-up of resistant forces) a

greater final strength a short hardening time (1 hour) and is impervious to water and gas. The composite material is produced from three components (base material, hardener, filler) for two applications (dowels, surface coatings), so that the thixotropy inhibits the flowing out of the material. The process described is particularly suited to swelling ground, semi-plastic and friable rock. Operational advantages result from unification of securing, propping, insulation and production of the inner lining in one operation (1 machine, 2 men). /TRRL/ [German]

Rotter, E Habenicht, H *Oesterreichische Ingenieur-Zeitschrift Analytic* Vol. 19 No. 3, Mar. 1976, pp 84-88, 2 Fig., 1 Phot., 2 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-304272)

ORDER FROM: Springer Verlag, 175 Fifth Avenue, New York, New York, 10010

00 157491

#### A GUIDE TO SITE INVESTIGATION PROCEDURES FOR TUNNELS

The report is a general guide to site investigation for bored and cut-and-cover tunnels and associated shafts and portals, constructed for sewers, aqueducts, transport and other services. It outlines the objectives of a site investigation for a tunnel and reviews the steps required in carrying out and reporting the investigation, the methods that may be used, and the considerations that must be borne in mind. Emphasis is placed on the importance of good core recovery and the full description of strata, the thorough examination of ground water conditions, and the value of in situ tests and trials. The value of a staged approach to the investigation, and the importance of full reporting of each stage of the work with full communication of results and conclusions to all interested parties, are also stressed. /Author/TRRL/

Dumbleton, MJ West, G

Transport and Road Research Laboratory Lab. Rpt. LR-740, 1976, 24 pp, 1 Fig., 2 Tab., 36 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-225199)

ORDER FROM: TRRL

00 157506

#### FOR WEED CONTROL ON SCL: THE SCIENTIFIC APPROACH

Vegetation control in the U.S. Southeast is complicated by the warm, moist climate. The program of the Seaboard Coast Line gives careful attention to selection of herbicides, spray volumes, and scheduling of applications on various mainlines, branches and yards.

*Railway Track and Structures* Vol. 73 No. 6, June 1977, pp 32-35, Photos.

ORDER FROM: ESL

DOTL JC

00 157515

#### SNOW CLEARANCE ON THE NORWEGIAN STATE RAILWAYS

[Snoryddingen ved NSB]  
No Abstract. [Norwegian]

Evenmo, O *NSB-Teknikk* Vol. 2 No. 3, 1976, pp 50-57, 13 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Norwegian State Railways, Storgaten 33, Oslo, Norway

00 157552

#### PROTECTION OF TRACK AGAINST AVALANCHES [Zascita puti ot sneznych lavin]

Technical instructions for the Far East network were recently approved for the construction of avalanche protection devices on sloping ground where avalanches are possible. The Rail Transport Research Institute has been studying rational methods of avalanche protection since 1976 and work has resulted in the development of efficient support and wind control systems. In view of the particular conditions on Sakhalin island, methods for designing buildings have been improved and ways developed for monitoring snowfall so as to be able to keep down the amount of snow accumulating on the slopes where avalanches are a serious possibility. [Russian]

Isaenko, EP *Put' i Putevoye Khozyaistvo* Vol. 21 No. 2, 1977, pp 28-30, 6 Fig., 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

00 157557

#### THE USE OF CELLULAR PLASTICS TO SOLVE PROBLEMS IN ENGINEERING GEOLOGY WITHIN SJ [Cellplasts anvandning foer loesande av ingenjoergeologiska problem inom SJ]

The article presents the present state of cellular plastic (polystyrene) intended for isolation against frost in railways and under buildings, its use and the claims on its quality. It is stated that cellular plastic is suitable as isolation against frost damage with very different applications. In this respect it is necessary to use prescribed qualities only, and the materials should be continuously controlled on delivery. [Swedish]

Sandegren, E *Jarnvagsteknik* Vol. 44 No. 5/6, 1976, pp 104-107, 4 Fig., 3 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48103

00 157580

#### NEW TUNNEL "SAN BERNARDINO" ON THE GENOA-VENTIMIGLIA LINE [La nuova galleria San Bernardino della linea Genova-Ventimiglia]

Tunneling through highly degraded shales, in the presence of buildings existent in vertical with respect to the portal, with an average coverage of about fifteen meters, required the perfecting of a particular method of construction. This method, based on the construction of a pre-portal, made up of metallic inserts injected with mortar, is briefly described, both with regard to the characteristics and the planning of the project, and with regard to the modalities for its execution. Furthermore, mention is made of the reasons which induced the rejection of defense structures of a different type, such as the underpinning or the consolidation of the terrains involved by means of chemical injections. The works described have been completely carried out, in full compliance with the programs of time and expenditure, and achieving the prime objective of safeguarding the integrity of the buildings located above the tunnel. [Italian]

Piepoli, G *Ingegneria Ferroviaria* No. 10, Oct. 1976, pp 3-12, 17 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

00 157595

#### STRUCTURAL MECHANICS SOFTWARE SERIES. VOLUME I

This book provides user documentation for readily available computer programs for structural analysis and design and reviewing and assessing programs, which are available on large, mini, and desk computers. Seven programs are documented in this volume and they are all available by remote terminal access on national computer networks. Also, programs are reviewed in the areas of computer-aided building design, symbolic and algebraic manipulation languages, curved girder bridge systems, floor analysis and design, and three-dimensional dynamic motion simulators. Technical area coverage for this series includes biomechanics, structural interaction with other media such as fluids or soils, fracture, rotor dynamics, fatigue, creep, dynamics, and statics. All pertinent engineering branches that in some way treat the structural mechanics discipline will be included in future volumes in this series.

Perrone, N Pilkey, W

University Press of Virginia No Date

ORDER FROM: University Press of Virginia, Box 3608, University Station, Charlottesville, Virginia, 22903

00 157704

#### PRESTRESSED CONCRETE BRIDGE DESIGN

This document is the third in a series prepared by ACI Committee 443 as part of longer, more comprehensive recommendations for bridge design which may eventually become an ACI recommended practice. This report proposes recommendations for prestressed concrete bridges, emphasizing those aspects of design and analysis peculiar to prestressed concrete and not covered in the general strength and service load recommendations previously

issued. Provisions herein are patterned primarily after those of ACI 318-71, Chapter 18, and the 1973 AASHTO Bridge Design Specifications, Division 1, Section 6; however, significant differences from each of the foregoing are noted.

Corley, WG *American Concrete Institute, Journal of* Vol. 73 No. 11, Nov. 1976, pp 597-612

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

00 157707

**EXPERIENCE AND INNOVATIONS IN THE PROTECTION OF THE FORMATION UNDER THE RAILWAY TRACKS OF THE DB**

Adequate protection of the formation under railway tracks is extremely important for safe and economical rail traffic. In the construction of new high-speed rail routes, in which great importance must attach to an accurate track bed and to low maintenance costs, the question of the best formation protection achieves new importance. The author's compilation of the experience gained by the DB with the great variety of methods which have been used in the last 50 years should therefore be of the greatest interest today. Soil mechanics findings, according to which formation protective layers must be load-supporting, filtering, and resistant to frost, water, vibration and impact, are also taken into consideration. In discussing formation protection with layers of siliceous sand, the author considers the conditions of supply and framework agreements for the delivery of siliceous sand and other details which have to be taken into account when placing such material. Also discussed are formation protection methods with filter fleece, ballast support layers, soil improvement with lime, soil stabilization with cement or bituminous binders, sheeting between layers of siliceous sand, polystyrene sheets between layers of siliceous sand, soil improvement with chemicals, concrete slabs and thin protective layers of plastic. In conclusion, consideration is given to still open questions relating to the economy and suitability of methods which await testing. [German]

Spang, J *Eisenbahntechnische Rundschau* Vol. 26 No. 4, Apr. 1977, 7 pp

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

DOTL JC

00 157904

**ASPECTS OF THE CONSTRUCTION OF RAILWAY BRIDGES**

[Quelques aspects de la construction des ouvrages d'art ferroviaires]

The author describes the main techniques used to build structures under railway tracks opened to traffic. The main difficulty resides in the fact that railway traffic can only be stopped for a very short period of time. As it is not possible to drive sheet pile walls in the vicinity of railway traffic, timbering is the best method for supporting excavations. If timbering is carried out as construction progresses, excavating operations can be kept to a minimum, and the erection of a support for the tracks can be simplified. Another technique is to increase the length of the temporary platforms supporting the tracks, by shoring up a series of ancillary bridges on metal bents and excavating on a large scale without timbering. The latter method enables a high degree of mechanization to be reached but increases the cost of the operations. Once the abutments of the final structure are completed, it is possible to build the deck. An example of an underpass in Lausanne is given. /TRRL/ [French]

Matthey, B (Swiss Federal Railways) *Bulletin Technique de la Suisse Romande Analytic* Vol. 102 No. 7, Apr. 1976, pp 137-142, 9 Fig., 1 Tab., 1 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 104201), Association of Swiss Road Specialists, Central Laboratory of Bridges & Highways, France  
ORDER FROM: ESL

00 157917

**CONSOLIDATION AND STABILIZATION OF TRACK PLATFORM USING PLASTIC SHEET AND INJECTED LAYERS**  
[Abdichtung und Stabilisierung des Unterbauplanums durch Plastfolien und Spritzschichten]

No Abstract. [German]

Zibbat, H Tresnak, Z *Signal und Schiene* Vol. 20 No. 11, Nov. 1976, pp 364-368, 1 Fig., 1 Tab., 16 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Transpress VEB Verlag fuer Verkehrswesen, Franzoesische Strasse 13-14, 108 Berlin, East Germany

00 157925

**THE TECHNICAL LAYOUT OF THE NEW DB LINES [Die technische Gestaltung der Neubaustrecken der Deutschen Bundesbahn]**

Using the operating programme, the author deals with the parameters that have a decisive influence on the technical layout of high speed lines. He particularly studies the problem of working out the planning parameters in terms of the optional conditions that vary over a period of time. [German]

Bubel, H *Eisenbahningenieur* Vol. 28 No. 1, Jan. 1977, pp 11-18, 7 Fig., 1 Tab.

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

00 157926

**SECONDARY CONSTRAINTS IN TRUSS BRIDGES. COMPARISON BETWEEN MEASUREMENT AND CALCULATION [Nebenspannungen in Fachwerkbruecken (Gegeneuberstellung Messung-Rechnung)]**

No Abstract. [German]

Suckow, H Mildner, K *DET Eisenbahntechnik* Vol. 25 No. 1, Jan. 1977, pp 13-16, 7 Fig., 3 Tab., 9 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

00 157928

**ABUKUMA-GAWA BRIDGE OF THE TOHOKU SHINKANSEN**

Problems are described of bridge erection, of placing and curing of the concrete, of prevention of cracks in this 526.5 m double-track reinforced-concrete bridge with its 5 continuous spans of 105 m each, reportedly the longest for a rail bridge of this type.

Kudo, H *Japanese Railway Engineering* Vol. 16 No. 3/4, 1976, pp 17-19, 4 Fig., 2 Tab., 2 Phot.

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

DOTL JC

00 157960

**EPOXY INJECTION REPAIRS A FAMILY LINES BRIDGE**

Restoration of the Seaboard Coast Line's reinforced concrete bridge across the Savannah River involved epoxy injection of the reinforced poured-in-place concrete caps. To rehabilitate the caps the cracks were cleaned and the epoxy resin was then injected through drilled holes.

*Progressive Railroading* Vol. 20 No. 3, Mar. 1977, pp 61-62, Photos.

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

DOTL JC

00 158199

**MATERIALS EVALUATION STUDY--BALLAST AND FOUNDATION MATERIALS RESEARCH PROGRAM**

This report presents the results of Phase IV-Materials Evaluation Study, of the Ballast and Foundation Materials Research Program. Emphasis is on characterizing the response of the structural support elements (subgrade, subballast, and ballast) with respect to in service loading conditions. Properties of the subgrade, the subballast, and the ballast that significantly influence track structure behavior and performance have been identified. Part A of the report includes the evaluation of the resilient (elastic) response and permanent strain response of 7 ballast and subballast materials. Part B contains plastic strain and degradation results of ballast materials subject to long term (1 million repetitions) loading. Part C includes the evaluation of resilient response and permanent strain response of ten subgrade soils.

Thermal regime characterization, including freeze-thaw analysis is presented in Part D. A comprehensive summary and conclusions are given in Part E. Sponsored by the FRA/U.S. DOT, Office of Research of Development.

Knutson, RM Thompson, MR Mullin, T Tayabji, SD  
Illinois University, Urbana Tech. Rpt. FRA-OR&D-77-02, Jan. 1977, 332 pp, Figs., Tabs., 81 Ref.

Contract DOT-FR-30038

ACKNOWLEDGMENT: FRA, NTIS  
ORDER FROM: NTIS

PB-264215/AS, DOTL NTIS

00 158284

#### DESIGN AIDS FOR CANTILEVER RETAINING WALLS

Design aids are given for the complete design of reinforced concrete cantilever retaining walls. A total of seven charts are prepared to design the retaining wall stem, footing length, heel and toe thickness, and to find the toe soil bearing pressure. A summary of equations used to develop the charts is included. The charts are drawn using the Strength Design Method of "Building Code Requirements for Reinforced Concrete (ACI 318-71)." Rankine earth pressure theory is used for a horizontal backfill, and the concrete ultimate strength is 3,000 psi with the steel yield strength of 60,000 psi. An example is included which shows the procedure of using the charts. These charts simplify the problem of designing a cantilever retaining wall by hand, and the charts are both accurate and efficient.

Gupta, MM (Maine Department of Transportation); Friel, LL *ASCE Journal of the Structural Division* Vol. 103 No. 5, May 1977, pp 1113-26, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

00 158307

#### TENTATIVE RECOMMENDATIONS FOR CABLE-STAYED BRIDGE STRUCTURES

Engineers in the United States are planning and designing cable-stayed bridges despite the paucity of design and construction data in the American technical literature. There are no American standard codes governing the design of cable-stayed bridges at this time. This report is presented as a guide to the design and construction of cable-stayed bridges and as such, it is a recommended practice not a code or specification. This report has been developed in the hope that it may be useful until such time as a more complete specification may be presented to the profession by American specification and code writing bodies. The report presents information relative to loads and forces, design assumptions, analysis, deflections, cables, saddles and end fittings, corrosion protection, fabrication, erection, inspection, temperature, fatigue, and aerodynamics.

Podolny, WJ (Federal Highway Administration) *ASCE Journal of the Structural Division* Vol. 103 No. 5, May 1977, pp 929-939

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

00 158308

#### WEIGHT-CREDIT FOUNDATION CONSTRUCTION USING FOAM PLASTIC AS FILL

By using foam plastic as a replacement fill, and thereby obtaining a dramatic "weight-credit", many potential construction sites in areas with weak soils may be developed to their full potential. On one job, the pressure caused by an embankment for a stream crossing was reduced from about 1200 psf to about 615 psf (at the abutment) by installing five feet of foam plastic (3 pcf) in place of soil backfill (120 pcf). The weak soils below were able to sustain the reduced pressure. This paper describes patented methods for similar weight-credit construction for highways, railroads, pipelines, airports, and retaining structures. Special applications for pile foundations are suggested.

Presented at the New Horizons in Construction Materials International Symposium, Lehigh University, Bethlehem, Pennsylvania, November 1-3, 1976.

Monahan, EJ (New Jersey Institute of Technology)  
Envoy Publishing Company Conf Paper Vol. 1, 1976, pp 199-210

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

00 159471

#### GEOLOGICAL PROBLEMS RELATING TO TUNNELS AND SUGGESTIONS FOR APPROPRIATE STANDARDS [La problematica geologica relativa alle gallerie e suggerimenti per una normativa in merito]

This paper itemizes the essential geological aspects which should be supported by standards, in the surveying, planning, construction and operation of tunnels. The basic concept is a knowledge of the regional geology as it applies to various types of tunnel (mine, railway, underground railway and road). Air photo geology, mechanical drilling and coring, geophysical surveys and geotechnical analyses are discussed as they apply to the design phase. The problems of hydrogeology, and rock and soil mechanics are defined in relation to excavation construction and tunnel lining. /TRRL/ [Italian]

*Strade Analytic* No. 2, Mar. 1976, pp 99-109

ACKNOWLEDGMENT: TRRL (IRRD-225693)  
ORDER FROM: Permanent International Assoc of Road Congresses, Via Adreani 4, Milan, Italy

00 159485

#### LARGE-DIAMETER BORED PILES AS A STRUCTURAL ELEMENT FOR BRIDGE FOUNDATIONS

[Grossbohrpfaele--Konstruktionselement fuer Brueckennunterbauten]

Basic principles and techniques of construction of bored pile foundations of highway and railroad bridges by using pile-wall and single pile construction methods are discussed and different possibilities of necessary pile head support in massive or steel superstructures are described as examples. [German]

Niemsch, H *Bauplanung-Bautechnik* Vol. 31 No. 2, Feb. 1977, pp 52-55, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

00 159486

#### SOIL STABILIZATION IN NEAR SURFACE TUNNEL CONSTRUCTION [Baugrundvevuetung beim Oberflaechennahen Tunnelbau]

Problems associated with the application of injection methods, requirements for injection agents, construction of injection piles, and application of the freezing process are discussed. [German]

Heyne, KH *Bauzeitung* Vol. 30 No. 12, Dec. 1976, pp 667-669, 4 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

00 159488

#### FROM GEOMECHANICS TO NATM: FURTHER TUNNELLING PROGRESS

Information is presented on the principle and progressive development of the New Austrian Tunnelling Method (NATM) and the tunnelling technicalities.

*International Construction* Vol. 16 No. 2, Feb. 1977, pp 38-43

ACKNOWLEDGMENT: EI  
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00 159490

#### MODERN MATERIALS FOR UNDERGROUND SUPPORT

The properties required of a support material for underground tunnels are discussed and, because concrete is both economical and easy to apply, a number of new reinforcing materials for concrete are examined with particular reference to these properties. From about thirty tests on different types of reinforced concrete, it is concluded that the addition of polymer to a concrete does not seem to influence the concrete's post-failure behavior, and the only benefit to be achieved by this addition is to increase its flexibility (or to decrease it, depending on the polymer). Steel fibers tend to increase both the strength and stiffness of the concrete, but polypropylene

fibers, although having definite load-carrying capacities, provide nonstable failure, also known as brittle failure. The best result is obtained for concrete reinforced with steel wire: the post-cracking strength is very good and is maintained for a considerable deformation.

McChesney, M (Witwatersrand University, South Africa) *South African Inst of Mining & Metall Journal* Vol. 77 No. 5, Dec. 1976, pp 114-118, 11 Ref.

ACKNOWLEDGMENT: EI  
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01 052645

**DEVELOPMENT OF HEAVY RAIL-PROFILES. STUDY OF A NEW 71 KG/M RAIL (ORE 71 PROFILE)**

The guiding principles for the study of heavy rail-sections already having been defined in a previous report (D 120/RP 1), calculations have been carried out on three heavy rail-sections with a view to defining a new rail of approximately 70 kg/m. Two of these sections represented a synthesis of 10 preliminary rail-section designs and would have to be compared with a third one chosen by way of reference (140 1B AREA American rail). The results of the calculations and the rolling conditions have finally enabled a new rail of 71.27 kg metric weight to be proposed.

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

International Union of Railways D120/RP 3/E, Oct. 1974, 29 pp, Figs.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 052907

**SPECIAL RAIL PROFILE FOR TUNNELS. PROTECTION OF RAILS AND RAIL FASTENINGS AGAINST CORROSION. (SUPPLEMENT TO FINAL REPORT)**

The report contains a supplementary description of the measures described in the Final Report D 81/RP 1 in order to deal with the corrosion of rails and rail fastenings. Reference is made to some of the tests conducted with rust inhibiting metallic and protective paint coatings.

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

International Union of Railways D81/RP 2/E, Oct. 1971, 16 pp, 1 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053204

**BEHAVIOUR OF THE METAL OF RAILS AND WHEELS IN THE CONTACT ZONE. 1. RESIDUAL STRESSES IN RAILS (ADDITIONAL MEASUREMENTS), 2. CHECKING OF THE FATIGUE CRITERION PROPOSED BY MR DANG VAN (ADDITIONAL MEASUREMENTS), 3. RELATIONSHIPS BETWEEN DYNAMIC WHEEL-LOAD AND WHEEL DIAMETER, 4. GENERAL CONCLUSIONS**

Parts 1 and 2 of this report give the results of the additional measurements, which confirm the results previously obtained during the study of the residual stress field in rails and also the fatigue criterion proposed in report C 53/RP 7. Part 3 gives the relationship to be taken into account in the choice of permissible dynamic wheel-load as a function of the wheel diameter. Part 4 summarises the respective influences of the principal parameters connected with rail fatigue.

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

International Union of Railways C53/RP 10/E, Apr. 1976, 44 pp, 36 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053217

**STANDARDISATION OF POINTS AND CROSSINGS. TESTS ON EXISTING TURNOUTS OR THOSE EXPLICITLY DESIGNED AT THE PROPOSALS OF THE D121 SPECIALISTS COMMITTEE--INITIAL CONCLUSIONS**

This report summarises the results of test runs on turnouts with speeds between 100 and 220 km/h on the diverging track. The tests were made by the FS, SBB, DR and SNCF. The results will permit specification of rail running face geometry for the switches negotiated, taking into account, in particular, their application in crossovers. Statements are also given concerning the running-in slope of check rails and the design of switch blade points in turnouts.

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

International Union of Railways D121/RP 2/E, Apr. 1976, 50 pp, 57 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053222

**OPTIMUM ADAPTATION OF THE CONVENTIONAL TRACK TO FUTURE TRAFFIC. A STUDY OF FACTORS INFLUENCING THE RESISTANCE TO TRANSVERSE DISPLACEMENT OF UNLOADED TRACK**

This report contains a compilation of test results of major importance concerning the resistance to transverse displacement, the results having been obtained by eight railway administrations (SNCF, DB, BR, SJ, CSD, PKP, NS and SBB) during the past 15 years. The results given concern, without exception, the unloaded track, i.e. track not subject to loading by vehicles at the time of testing. Tables and diagrams are used to establish, and discuss, the parameters affecting the resistance to transverse displacement.

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

International Union of Railways D117/RP 8/E, Oct. 1976, 21 pp, 21 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053223

**OPTIMUM ADAPTATION OF THE CONVENTIONAL TRACK TO FUTURE TRAFFIC. INVESTIGATION OF THE MAINTENANCE WORK CONTRIBUTIONS FOR DIFFERENT TYPES OF TRACK SUPERSTRUCTURE**

This report gives an account of numerous observations made on the Swedish Railways. It deals with the relationship between traffic and level and alignment, as well as with the effect of the associated work on the maintenance operations for different types of track. The results of the investigations seem to show, among other things, that less maintenance work is needed: with concrete sleepers than with soft wooden sleepers, with concrete sleepers of the mono-block type than with concrete sleepers of the two-block type, and with hard wood sleepers than with concrete sleepers. It should be observed however that the maintenance work carried out on a high quality track sometimes results in a decrease in this quality.

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

International Union of Railways D117/RP 9/E, Oct. 1976, 37 pp, 48 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 053224

**UPDATING OF THE TECHNICAL SPECIFICATIONS FOR THE SUPPLY OF RAILS. PROVISIONAL TOLERANCES FOR THE ORE 71 RAIL- PROGRAMME OF MEASUREMENTS**

The report is composed of two parts, one of which deals with the provisional manufacturing tolerances for the ORE 71 rail, developed by the D 120 Committee and the other with a programme of measurements to be carried out by the rail manufacturers to verify the manufacturing possibilities as far as the adherence to the nominal dimensions of the rail sections are concerned.

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

International Union of Railways D144/RP 1/E, Apr. 1976, 21 pp, 5 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

01 096543

**EVOLUTION OF PERMANENT WAY FOR 300 KM/H LINES**

France is unique in having two experimental vehicles-- powered by gas turbines and electricity--which can be used to collect large amounts of data on track/train interaction at speeds in the 260 to 300 km/h range. SNCF

has concluded that conventional sleepered track with only minor modification can be used for scheduled services at 260 km/h, and specifications have now been drawn up for new lines such as Paris-Sud-Est which are designed for 300 km/h. Details of this track design are given.

Prud'homme, A (French National Railways) *Railway Gazette International* Vol. 131 No. 4, Apr. 1975, pp 144-148, 3 Fig., 1 Tab., 2 Ref.

ORDER FROM: ESL

DOTL JC

01 136979

**DATA ANALYSIS AND INSTRUMENTATION REQUIREMENTS FOR EVALUATING RAIL JOINTS AND RAIL FASTENERS IN URBAN TRACKS**

Rail fasteners for concrete ties and direct fixation and bolted rail joints have been identified as key components for improving track performance. However, the lack of statistical load data limits the development of improved design criteria and evaluation tests. This report evaluates the data required for design, laboratory tests, and for the development and verification of analytical models of fastener and joint performance. Available track instrumentation is reviewed for fulfilling these requirements, and functional specifications have been developed for improved tie plate load cells and instrumented wheels. Also included are recommendations for data analysis and data processing procedures and test site selection criteria needed to plan and conduct comprehensive measurement programs.

Prause, RH Harrison, HD  
Battelle Columbus Laboratories, Transportation Systems Center, Urban Mass Transportation Administration Final Rpt. DOT-TSC-UMTA-75-2, Feb. 1975, 156 pp

Contract DOT-TSC-563

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-253192/9ST, DOTL NTIS

01 144468

**PIT-RUN GRAVEL FOR RAILWAY BALLAST-GOST 7394-70. OFFICIAL PUBLICATION [Gravii kar'ernyi dlia ballastnogo sloia zhelezodorozhnogo puti-GOST 7394-70. Izdanie ofitsial'noe]**

The Standard deals with pit-run gravel, which is a natural pebbly-gravel-sand mixture originating as results of natural disintegration of rock. 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". Technical specifications provide for the number of 0.1 to 3 mm quartz grains to be not less than 50% of the mass. The amount of soft rock grains in the gravel cannot exceed 15%. The coefficient of permeability is determined according to Appendix 2, and the details of the testing instrument are presented. The calculation of contents (in %) of grains of different sizes in the ballast is made by different formulae for grains over 100 mm; from 100 to 60 mm; from 60 to 3 mm; from 3 to 0.1 mm, and for less than 0.1 mm. A description is given for the calculation of percentage contents of clayey particles, which should not exceed 0.5 to 1%. Rules of acceptance, testing methods and transportation and storing procedures are described. [Russian]

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

USSR Council of Ministers for Constr Matters 1970, 10 pp, 3 Fig., 3 Tab., 2 App.

ORDER FROM: USSR Council of Ministers of Constr Matters, Moscow, USSR

01 144469

**SHELL ROCK FOR RAILROAD BALLAST-GOST 7395-70. OFFICIAL PUBLICATION [Rakushka dlia ballastnogo sloia zhelezodorozhnogo Puti-GOST 7395-70. Izdanie ofitsial'noe]**

The Standard deals with shell rock, consisting of whole and broken shells, used for railroad ballast. Its use is controlled by active standards (SN and P), and by "Conclusions on conducting planned-and-preventive maintenance of the upper track structure, earthen roadbed, and artificial structures of USSR Railroads". Technical specifications provide for the contents of particles of the following dimensions: 0.5 mm-not less than 50%; 0.1 mm-not

to exceed 6%; in this not more than 1.5% of clayey particles. These percentages are calculated from different formulae, according to size. The method of calculating the percentage of clayey particles is described. The coefficient of permeability should be not less than 30 mm per 24 hours. If necessary, the control of above calculations is made using the areometric method. Rules of acceptance and testing methods are described, as well as transportation and storing procedures. [Russian]

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

USSR Council of Ministers for Constr Matters 1970, 9 pp, 3 Fig., 3 Tab., 2 App.

ORDER FROM: USSR Council of Ministers for Constr Matters, Moscow, USSR

01 146672

**ROADS AND RUNWAYS: SNOW REMOVAL AND DEICING TECHNIQUES (A BIBLIOGRAPHY WITH ABSTRACTS)**

The bibliography covers research reports on materials, maintenance, costs, corrosion inhibition, pollution, and the planning applied to snow and ice removal. Applications cover bridges and railroads as well as highways and runways. (This updated bibliography contains 143 abstracts, 51 of which are new entries to the previous edition.)

Supersedes NTIS/PS-75/829, and NTIS/PS-75/061.(PC N01/MF N01)

Brown, RJ

National Technical Information Service Bibliog. Dec. 1976, 148 pp, 143 Ref.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-76/0987/8ST, DOTL NTIS

01 148584

**MAINTENANCE-SAVING TRACK**

With higher traffic volume and faster trains, the time intervals available for track maintenance have decreased. Soaring costs and manpower shortages have restricted the amount of manual maintenance that is possible and have aggravated the deterioration of track. To resolve this problem, Japanese National Railways has put in service new track maintenance equipment and developed track structures which reduce maintenance requirements. Details of concrete slab track, track with asphalt-filled ballast and paved track are described. A special fastener for conventional track on bridges is also described.

Miyamoto, T (Japanese National Railways) *Japanese Railway Engineering* Vol. 16 No. 2, 1976, pp 10-13, 7 Fig., 4 Phot.

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01 148592

**A PRELIMINARY DESCRIPTION OF STRESSES IN RAILROAD RAIL**

One portion of the Federal Railroad Administration's (FRA) Track Performance Improvement Program is the development of engineering and analytic techniques required for the design and maintenance of railroad track of increased integrity and safety. Under the program management of the Transportation Systems Center (TSC), one portion of this program predicts the reliability of rail in track. A necessary requirement for the development of these techniques is the ability of determining the stress and strain history of the rails in service. This is necessary to form a more comprehensive basis for a quantitative understanding of flaw initiation and growth. This report is one of a series of reports that provides a comprehensive description of stresses in rail required for predicting the reliability of rail in track structures. It provides a description of stresses encountered in railroad rails compiled from information available in the literature before 1976.

Research was sponsored by the Federal Railroad Administration, DOT, through the Transportation Systems Center, Cambridge, Massachusetts.

Johns, TG Davies, KB

Battelle Columbus Laboratories, (DOT-TSC-FRA-76-23) Intrm Rpt. FRA-OR&D-76-294, Nov. 1976, 136 pp, 73 Fig., 6 Tab., 97 Ref., 1 App.

Contract DOT-TSC-1038



ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

01 148609  
**CONCRETE TRACK TRAILS IN HOLLAND**  
No Abstract.

Steur, W de *Railway Engineer* Vol. 1 No. 3, May 1976, pp 25-30, 3 Fig., 3 Tab.

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

DOTL JC

01 148619  
**BETTER RAILWAY TRACK**

Some of the shortcomings of conventional railroad track are described 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 railroad track are considered.

Maynier, LXH *Civil Engineer in South Africa* Vol. 18 No. 6, June 1976, pp 125-130

ACKNOWLEDGMENT: EI  
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01 148620  
**NEW LORAM SELF-PROPELLED UNIT FOR GRINDING RAIL OUT OF FACE**

The paper features a rail-grinding machine designed to grind down corrugations and other defects that occur in rail that has been subjected to between five and ten million gross tons, or before corrugations become advanced to the extent that replacement of the rail or other maintenance procedures become necessary. The self propelled machine is designed to remove between .003 in. and .005 in. of metal during each pass.

*Railway Track and Structures* Vol. 72 No. 9, Sept. 1976, pp 16-17

ACKNOWLEDGMENT: EI  
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01 148819  
**PLANNING OF OPERATIONS DURING CONSTRUCTION WORK. WORK-SITE SERIES [Baubetriebsplanung. Baustellenserien]**

From the operating standpoint, construction work reduces the quantitative and qualitative throughput of lines on account of track closures and speed restrictions. The author examines the method of "work-site" series which reduces drawbacks and consists basically of simultaneously concentrating work sites and equipment on given lines. [German]

Muehlhans, E *Die Bundesbahn* Vol. 52 No. 8, Aug. 1976, pp 525-528, 1 Fig., 1 Phot.

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

01 148820  
**RAIL TRACK CONSTRUCTION AND MAINTENANCE TECHNIQUES [La voie ferree. Techniques de construction et d'entretien]**

This document deals with the basic problems of track mechanics, developments of maintenance methods, use of long welded rails and line equipment for electric traction from a deliberately theoretical and mathematical angle; it compares the techniques used nationally today by the SNCF with the research done internationally by the Office for Research and Experiments (ORE) and describes track building prospects for very high speeds. The author, who is the Head of the SNCF Way and Works Department, also considers the economic aspects of track layout and stresses the realistic approach to maintenance methods. [French]

Alias, J (French National Railways)  
Editions Eyrolles Monograph 1977, 474 pp, 265 Phot., 2 App.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Editions Eyrolles, 61 Boulevard St-Germain, Paris F-75005, France

01 148822  
**APPLICATION OF A NEW TECHNOLOGY FOR RENEWING CONVENTIONAL WELDED RAIL TRACKS [Wdrozenie nowej technologii wymiany szyn klasycznych na bezстыkowe]**

Description of the so-called continuous method of replacing rails, by laying them directly from the working train, and simultaneously welding them while loading the old rails onto another working train. The author gives a detailed description of the organization of the work, and discusses the advantage of this method as compared with others in use. This comparison proves the advantages of the continuous method. [Polish]

Zimnoch, S *Przegląd Kolejowy Drogowy* Vol. 23 No. 6, June 1976, pp 1-5, 2 Tab., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Wydawnictwa Komunikacji i Łączności, Ul Kazimierzowska 52, Warsaw 12, Poland

01 148830  
**DEVELOPMENT OF PERMANENT WAY FACILITIES DURING THE USSR TENTH FIVE-YEAR PLAN (1976-1980) [Razvitiye putevovo hozhajstva v desjatoj pjatiletke]**

The article provides the following data on the period involved: Work carried out to improve track installations and operation; prospects as regards the complex mechanization of track work; prospects as regards the improvement of routine track maintenance operations. [Russian]

Pasinin, SA *Zheleznodorozhnyi Transport* No. 9, 1976, pp 41-49, 1 Tab., 4 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Zheleznodorozhnyi Transport, Novo-Basmannaya ul. 4, Moscow B-174, USSR

01 148832  
**BALLASTLESS TRACK IN TUNNELS [Schotterloser Oberbau im Tunnel]**

Different types of experimental ballastless track were laid in two tunnels in connection with the electrification of the Heidelberg-Wurtzburg line to avoid changing the arch and the foundation raft in the tunnels despite the different clearances required. The authors describe the experience gained from this project and the sound insulation measures taken. [German]

Osswald, R Solf, H *Eisenbahningenieur* Vol. 27 No. 9, Sept. 1976, pp 354-362, 9 Fig., 1 Tab., 5 Ref.

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

01 149390  
**SIMULATION METHOD OF PREDICTING SINGLE REPLACEMENTS OF RAILROAD SLEEPERS [Symulacyjna metoda prognozowania pojedynczych wymian podkladów kolejowych]**

It is suggested that not every single sleeper, found inoperative in a track, has to be replaced at once. As a criterion for single replacements a number d of neighboring ineffective sleepers is adopted. Appreciating the probabilistic nature of single replacements, a model of the process is constructed and a solution arrived at by means of computer simulation. Field observations show that the number a considerably influences the number of single replacements. Separate investigations are necessary in order to select specific values of d for given structural and maintenance conditions of the track. Some pilot tests on gage changes is a result of different thrusts and different number of ineffective sleepers show that the number d should rather be less than three. [Polish]

Baluch, H *Archiwum Inzynierii Ladowej* Vol. 22 No. 3, 1976, pp 501-516, 7 Ref.

ACKNOWLEDGMENT: EI  
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01 149394

**RAIL TRACK FOR HEAVY UNIT TRAIN OPERATIONS**

High wheel loads provide a range of rail track design problems which can lead to conflict in reaching a satisfactory solution. A procedure is being developed to predict rail strength levels necessary to minimize the problems of rail plastic flow and corrugation and avoid some of the conflicts.

Presented at the Institution of Engineers (Australia) Annual Engineering Conference, held in Townsville, Australia, May 10-14, 1976.

Mair, RI Jupp, RA

Institution of Engineers, Australia Conf Paper Pap 6321, 1976, pp 383-387, 13 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Institution of Engineers, Australia, Science House, Gloucester and Essex Streets, Sydney, Australia

DOTL JC

01 149413

**TOLERANCES FOR TRACK MEASUREMENTS [O dopuskah soderzaniya rel'sovoj kolej]**

The article shows that prevailing standards for the production of permanent way components make it possible to reduce track gauge tolerance to plus 4 mm. It also gives a calculation for track gauge tolerances based on the theory of probability. [Russian]

Bogdanov, VI *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 36-39, 2 Fig., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 149415

**METHOD OF ESTIMATING DEFORMABILITY OF THE TRACK FORMATION BY FORECAST OF PROBABILITIES [Metod veroyatnostno-prognosticeskoj ocenki deformativnosti zemljanogo polotna]**

The article proposes a method of forecasting the deformability of the track formation based on an approximation system, taking into account the stochastic character of forces to which the track formation is subjected. Using a deformability index, this method makes it possible to make a general estimate of the state of the track bed at any moment. [Russian]

Jakovleva, TG *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 42-46, 1 Fig., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 149424

**EVOLUTION OF THE GEOMETRIC STATE OF THE TRACK AND TECHNICO-ECONOMIC OPTIMISATION OF DECISIONS FOR TRACK MAINTENANCE AND RENEWAL. STUDY OF A COMPREHENSIVE MODEL [La evolucion del estudio geometrico de la via y la optimizacion tecnico-economica de las decisiones para su conservacion y renovacion. Estudio de un modelo conjunto]**

Research on the evolution of the geometric state of the track is in the experimental stage. The author explains in detail a model representing the intervention decisions using a prediction system for deterioration in quality and a system of economic values taking account of the effect of foreseeable actions. [Spanish]

Loez Pita, JJ

Asociacion de Investigacion del Transporte No. 9, Apr. 1976, pp 67-68, 5 Phot., 23 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Association de Investigacion del Transporte, Madrid, Spain

01 149430

**POSSIBILITIES OF USING COMPUTER SIMULATION WHEN COMPILING PLANS FOR THE TECHNOLOGICAL PROCESSES INVOLVED IN TRACK MAINTENANCE WORK [Mozliwosci wykorzystania symulacji komputerowej w projektowaniu procesow technologicznych robot nawierzchniowych]**

After presenting the theoretical analysis of the problem on the model of the coordination of the work of the ballast cleaning and renewal machines, the

authors explain the purpose of this type of investigation, and its importance in the optimum choice of the technological process of mechanised track work. The authors also analyse the results of tests completed by the PKP during 1974-1975, and illustrate by diagrams and tables the relationship of the parameters adopted. [Polish]

Baluch, H Sancewicz, S *Przeglad Kolejowy Drogowy* Vol. 23 No. 9, Sept. 1976, pp 10-16, 9 Fig., 1 Tab., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 149441

**A STUDY OF FAILURES IN TRACK MAINTENANCE MACHINES [Schadensforschung an Oberbaumaschinen]**

Studies on the frequency of failures make it possible to detect those which hinder operation, and to determine what preventive maintenance work and stocks of spare parts or components are required. These studies also show what improvements should be made in the construction of the machines. [German]

Sauerwein, H *Eisenbahntechnische Rundschau* Vol. 25 No. 10, Oct. 1976, pp 616-618, 3 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

01 149449

**NEW MEANS AND METHODS OF SNOW FIGHTING ON USSR RAILWAYS**

Snow fighting on USSR Railways is conducted under difficult conditions including snowstorms, prolonged and heavy snowfalls, low temperatures, ground winds and icing. The majority of lines are protected against deep drifting by plantings of trees or bushes, or by temporary or permanent snow fences. A variety of snow plows and other snow clearing units efficiently remove snow from track and other facilities. All these methods assure uninterrupted train operation and permit swift clearing of tracks even under adverse conditions.

Tsepushelov, AL Troitsky, LF (USSR Ministry of Railways) *Rail International* No. 11, Nov. 1976, pp 612-629, 25 Fig., 8 Ref.

ACKNOWLEDGMENT: Rail International

ORDER FROM: ESL

DOTL JC

01 149452

**A SWITCH WHICH CAN BE TRAVERSED IN THE SWITCHING DIRECTION AT 220 KM/H. DESIGN, CONSTRUCTION, TRIALS**

The purpose of this article is to present new switches which can be traversed at 220 km/h which were designed and tested by French National Railways with the intention of installing them in the new Paris-Southeast ultra-high-speed line. Line capacity of routes can be enhanced if junctions and crossovers may be traversed at high speed. The article indicates design criteria, technical considerations, prototype construction, testing procedures and test results.

This article also was published in the March, 1976 issue of the *Revue Generale des Chemins de Fer*.

Alias, J (French National Railways) *Rail International* No. 12, Dec. 1976, pp 678-688, 15 Fig., 1 App.

ACKNOWLEDGMENT: Rail International

ORDER FROM: ESL

DOTL JC

01 149950

**STRESSES CAUSED BY THE LOAD OF TRAINS IN SMALL-SIZE REINFORCED-CONCRETE TRACK SUPPORT SLABS [Naprazheniya v malogabaritnyh ramah of poezdnoj nagruzki]**

The article describes the results of a study into these stresses in places where cracks are most likely to occur. It also gives recommendations for the value of the pre-stressing forces in the concrete. [Russian]

Barabosin, VF *Vestnik Vniizt* Vol. 35 No. 7, 1976, pp 41-45, 7 Fig., 2 Tab., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

01 149953

**THEORETICAL STUDY OF MECHANICAL PROPERTIES OF ELEVATED OPEN- FLOORED DIRECT FASTENED TRACK**

JNR is contemplating adoption of this type of structure in regions with heavy snowfall involving the use of elastic rubber mats as a beam support. The preliminary report briefly presents some of the results of behaviour of the tracks laid as indicated. The provisional conclusion is that, with certain precautions, this method could be used for the Shin Kansen line, which is scheduled for 260 km/h operations.

Mura, S *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 1, Mar. 1976, pp 36-37, 5 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

DOTL JC

01 149964

**ULTRASONIC FLAW DETECTION OF THERMIT WELDED JOINTS**

The increase in the incidence of fractures in welded rail joints led the Indian Railways to attempt ultrasonic detection of flaws in the thermit welds. The article describes the research carried out on this question, by which it is hoped to determine positive criteria for the use of ultrasonic methods in thermit weld inspection.

Agarwala, G *Indian Railway Technical Bulletin* Vol. 33 No. 200, Feb. 1976, pp 19-29, 11 Fig., 9 Tab., 7 App.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Research Design and Standards Organization, Alambagh, Lucknow 5, India

01 149966

**EFFECTS OF THE RIGIDITY OF THE TRACK-BED UNDER REINFORCED- CONCRETE SLAB JOINTS USED IN TRACK INFRASTRUCTURE ON THE TENSILE STATE OF THE SLABS [Vlijanie zestkosti osnovanija v styke podrel'sovyh zelezobetonnih blokov na ih naprjazennoe sostojanie]**

The article describes the results of a theoretical study of these effects on the value of the slab flexural moment and on the vertical movements of these slabs. [Russian]

Kilmenko, VJa *Vestnik Vniizt* Vol. 35 No. 7, 1976, pp 49-51, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

01 149984

**SUITABLE LAYING TECHNIQUES AND PLAY PERMITTED FOR RAIL JOINTS IN AREAS WHERE THERE IS A**

**CHANGEOVER TO LONG WELDED RAILS [Zweckmassige Verlegebeziehungen und zulassige Stosslucken im Übergangsbereich zum Luckenlosen Gleis]**

No Abstract. [German]

Franz, J *DET Eisenbahntechnik* Vol. 24 No. 11, Nov. 1976, pp 508-512, 8 Fig., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

01 150408

**HOW AUTOMATED TRACK-LINING AND RAISING SYSTEMS WORK. 5-- THE TAMPER SYSTEM**

This method for measuring track geometry is based on a light-beam-operated reference system. The determination for lifting and cross

leveling is based on a horizontal plane practically floating above the track at a constant distance at all times. The measurement of horizontal track alignment works basically on continuous stringlining with the chord being a light beam. Variations on the automatic system can involve lower levels of automation than possible with the photoelectric sensors and associated controls.

See other articles in series: Part 1 (RRIS 01 141121 7701), Part 2 (RRIS 01 141564 7701), Part 3 (RRIS 01 142950 7701), Part 4 (RRIS 01 152522 7702).

von Beckman, H (Canron Railgroup) *Railway Track and Structures* Vol. 73 No. 1, Jan. 1977, pp 24-27, 14 Fig.

ORDER FROM: ESL

DOTL JC

01 151139

**NORTHEAST CORRIDOR HIGH-SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROGRAM. TASK 19-SUPPORT SERVICES: DYNAMICS AND COMPUTER PROGRAM DEVELOPMENT**

The report is a summary of the effect of track curvature and spiral length on high speed train safety and comfort, and the effect of speed and axle load on track stability and wear. In addition, information is presented relating track curvature, spiral length, and train and track dynamics to support system performance and cost studies.

Prepared in cooperation with Battelle Columbus Labs., Ohio. See also PB-261 542.

Ronald, CC Arnlund, RC Ferber, WE Doyle, GR, Jr Noble, SL Bechtel Corporation, Battelle Columbus Laboratories, Federal Railroad Administration Final Rpt. FRA/ONECD-76/19, July 1976, 279 pp

Contract DOT-FR-66005

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-262236/3ST, DOTL NITS

01 151837

**BALLAST AND FOUNDATION MATERIALS RESEARCH PROGRAM. PHASE IV. MATERIALS EVALUATION STUDY**

This report presents the results of Phase 4-Materials Evaluation Study, of the Ballast and Foundation Materials Research Program. Emphasis is on characterizing the response of the structural support elements (subgrade, subballast, and ballast) with respect to in service loading conditions. Properties of the subgrade, the subballast, and the ballast that significantly influence track structure behavior and performance have been identified. Part A of the report includes the evaluation of the resilient (elastic) response and permanent strain response of 7 ballast and subballast materials. Part B contains plastic strain and degradation results of ballast materials subject to long term (1 million repetitions) loading. Part C includes the evaluation of resilient response and permanent strain response of ten subgrade soils. Thermal regime characterization, including freeze-thaw analysis is presented in Part D. A comprehensive summary and conclusions are given in Part E.

Knutson, RM Thompson, MR Mullin, T Tayabji, SD Illinois University, Urbana, Association of American Railroads Technical Center, Federal Railroad Administration Tech. Rpt. FAA/ORD-77/02, Jan. 1977, 324 pp

Contract DOT-FR-30038

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264215/5ST, DOTL NTIS

01 152396

**UNDERGROUND RAILWAY TRACK EQUIPMENT [Armamento delle metropolitane]**

The author gives information on rail measurements which are used for most of the world's underground railways and then calculates track characteristics and permissible rail wear limits. He describes the precautions that must be taken to limit corrugation and the most well-known track construction methods used for underground railways as well as for surface rail systems. [Italian]

Zignoli, V *Ingegneria Ferroviaria* Vol. 23 No. 4, Apr. 1976, pp 24-42, 20 Fig., 13 Tab., 20 Phot.

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

DOTL JC

01 152402

**EXAMINATION OF SURFACE CRACKS IN CARBON AND MANGANESE STEEL RAILS BY THE EDDY-CURRENT TECHNIQUE**

The technique, resources and limitations of this method of examining rails; in some ways it is complementary to magnetoscopic methods and makes it possible to determine how deep cracks are.

Banks, J Hansford, DC *Permanent Way Institution, Journal & Rpt of Proc* Vol. 94 No. t2, 1976, pp 98-105, 5 Phot., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Derry and Sons, Limited, Canal Street, Nottingham, England

DOTL JC

01 152416

**OPTIMISATION OF THE COMPOSITION OF WIRE FOR SUBMERGED ARC WELDING FOR BUILDING UP POINTS CROSSINGS WITH HIGH MANGANESE CONTENT [Optimizacija sostava poroskovoj provoloki dlja naplavki vysokomargancovityh krestovin]**

No Abstract. [Russian]

Bykov, AN *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 50-54, 2 Fig., 3 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

01 152417

**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., 6 Tab., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

01 152420

**EQUATIONS FOR CONDITIONS ON TRACK SECTIONS ON CURVES [Kriterial'nye uravnenija dvizenija lokomotivov v krivyh ucastkah puti]**

No Abstract. [Russian]

Evenko, VV *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 26-31, 7 Fig., 1 Tab., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

01 152426

**FINITE ELEMENT TRACK BUCKLING MODEL**

The objective of this paper 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 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 is in reasonably good agreement with test data in the literature. A parameter investigation indicates that the lateral thermal buckling load of a tangent track is significantly affected by changes in lateral ballast resistance, misalignments, and the presence of ineffective ties.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

So, W Martin, GC (Association of American Railroads Technical Center)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-5, Mar. 1977, 7 pp, 8 Fig., 1 Tab., 13 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

01 152430

**ESTIMATING EFFECT OF HEAVY WHEEL LOADS ON RAIL LIFE: ROLLER BEARING ANALOGY**

There has been considerable controversy as to the cost of operating unit trains consisting of 100-ton cars. Part of the problem was difficulty of estimating the cost of track maintenance. This paper utilizes roller bearing theory to offer a way to establish at least a part of the total cost.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Guins, SG

American Society of Mechanical Engineers Conf Paper Paper 77-RT-9, Mar. 1977, 7 pp, 5 Fig., 3 Tab., 5 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

01 152455

**ANALYSIS OF THE POSSIBILITIES FOR USING 12.5 CM THICK WOODEN SLEEPERS [Analiza mozliwosci zastosowania podkladow drewnianych o grubosci 12.5 cm]**

The authors make an economic analysis of the possibilities for using wooden sleepers on the PKP. What is involved concerns factors affecting the strength and technical characteristics of the wood used for sleepers and the effect of humidity and sleeper impregnation. The authors also deal with the effects of reducing the thickness of sleepers on their strength and especially that of the rail fastenings. [Polish]

Zielinska, K Dysko, A *Przeglad Kolejowy Drogowy* Vol. 23 No. 7/8, July 1976, pp 3-7, 3 Fig., 2 Tab., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Wydawnictwa Komunikacji i Lacznosci, Ul Kazimierzowska 52, Warsaw, Poland

01 152458

**RAIL WEAR AND CORRUGATION STUDIES**

The Mt. Newman Mining Company's ore-hauling railway in Australia began investigating track and vehicle performance after rail corrugation became serious when 50 million gross tons of traffic had traversed its line. Over 2,000 100-ton gondolas are used to make up 138-car trains, up to 10 of which are operated daily at speeds of up to 72 km/h. Climate is hot and dry. Curve wear takes place at the gauge corner on the high rail with head crushing on the low rail and long-pitch corrugations on the high rail. Information is given on the variation in vertical wheel loads in a single ore train, distribution of lading variation in the cars, and on rail head wear on unit-train railways in Australia, Brazil, Canada and the U.S.

Discussion of a paper by F.E. King and J. Kalousek published in *AREA Bulletin* Vol. 77, No. 658, (June-July 1976). See RRIS 01 139941, 7701.

Mair, RI (BHP Melbourne Research Laboratories); Murphy, RS (Mt Newman Mining Company) *AREA Bulletin* Discussion Vol. 78 No. 660, Nov. 1976, pp 265-272, 3 Fig., 3 Tab., 9 Ref.

ACKNOWLEDGMENT: AREA  
ORDER FROM: ESL

DOTL JC

01 152463

**A FEASIBILITY STUDY FOR THE MEASUREMENT OF TRACK MODULUS BY RAILWAY TRACK RECORDER CARS**

Utilizing a classical model for the deflection of railway track under load, a method for measuring track modulus using existing track recorder cars is

investigated. The method requires the measurement of the relative vertical deflections of the wheels of a 3-axle vehicle truck. Because the measurement is sensitive to vertical track profile imperfections, a statistical model of real track is used to determine the track sample lengths required to estimate track modulus to a given accuracy.

Presented at the 1977 Joint ASME/IEEE/AAR Railroad Conference, March 30-April 1, in Washington, D.C.

Aplevich, JD (Waterloo University, Canada)  
Institute of Electrical and Electronics Engineers Tech. Pap.  
77CH1237-71A, 1977, pp 26-31, 8 Fig., 2 Ref.

ACKNOWLEDGMENT: IEEE  
ORDER FROM: ESL

DOTL RP

**01 152522**  
**HOW MECHANIZED TRACK-LINING AND RAISING SYSTEMS**  
**WORK 4- THE REXNORD SYSTEM**

For the Rexnord system, evolution from visual control of track lining and raising has produced the Nordberg Line Indicator. The Line Indicator utilizes a taut wire referenced to the line rail. The operator reads necessary alignment corrections from a dial to operate the controls for the Nordberg Trak-Surfacers.

See other articles in series: Part 1 (RRIS 01 141121 7701), Part 2 (RRIS 01 141564 7701), Part 3 (RRIS 01 142950 7701), Part 5 (RRIS 01 150408 7702).

Rushmer, JR *Railway Track and Structures* Vol. 72 No. 12, Dec. 1976, pp 28-31, 5 Fig.

ORDER FROM: ESL

DOTL JC

**01 152631**  
**THE HIGH SPEED TRACK RECORDING COACH**

The high speed track recording coach, designed by the R&D Division for use by BR is described. The coach, based on a Mk.II body shell, can operate at speeds of 200 km/h and is able to record and analyse track geometry parameters. Results of analyses can be printed out on-board and there is a magnetic tape data interchange with a main frame computer.

Lewis, RB *Permanent Way Institution, Journal & Rpt of Proc* Vol. 93 No. t 3, 1976, pp 136-144, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Derry and Sons, Limited, Canal Street, Nottingham, England

**01 152641**  
**RAIL IN THE TRACK STRUCTURE**

A general survey of problems connected with rails: Stresses in the rail, steel and rail specifications, the influence of certain factors such as traffic, wheel radius, axle load, rail section design, track structure and flaws, on service life and rail deterioration, and economic aspects governing types of rail chosen.

Srinivasan, M *Rail International* Vol. 8 No. 1, Jan. 1977, pp 33-38

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

DOTL JC

**01 152657**  
**AN INVESTIGATION OF RAIL-TO-CONCRETE FASTENERS**

Prestressed concrete ties are being increasingly used. This investigation deals with rail-to-concrete ties, bridge decks, and tunnel linings. For spring-clip fasteners in concrete ties, three methods of electrical insulation are studied. These fasteners were subjected to tie-wear tests, longitudinal-slip tests and electrical-resistance tests. The anchors used were also subjected to pullout tests. For fasteners in bridges and tunnels, three different fasteners were tested under repeated loading. In addition, the "second-cast" method of construction was studied.

Reprinted from the Journal of the PCA Research and Development Laboratories, Vol. 10, No. 3 (September 1968), pp 14-35.

Hsu, TTC Hanson, NW

Portland Cement Association, (PCA.R&D.Ser.1381-2) Reprint Bulletin D146, 1968, 27 pp, 35 Fig., 5 Tab., 9 Ref.

ORDER FROM: Portland Cement Association, Research and Development Laboratories, 5420 Old Orchard Road, Skokie, Illinois, 60076

DOTL RP

**01 152681**  
**THE FLORIDA EAST COAST RAILWAY COMPANY AND THE**  
**CONCRETE CROSSTIE**

Starting in 1964 as it installed Centralized Traffic Control and reduced segments of its main line to single track, Florida East Coast also began extensive installations of concrete cross ties. By the end of 1976 FEC had 186 track miles of concrete cross ties in service and 31.1 additional miles authorized for 1977. The installation procedures, problems experienced with the ties and ballast, and the current standards for track structures rebuilt with concrete cross ties are described. FEC has also acquired a plant for manufacturing cross ties and the manufacturing and prestressing procedures are also described.

Florida East Coast Railway Company Jan. 1977, 18 pp, 4 Fig.

ORDER FROM: Florida East Coast Railway Company, Office of Chief Engineer, St. Augustine, Florida

**01 152790**  
**FEASIBILITY STUDY OF A METHOD FOR OBSERVING TRACK**  
**STIFFNESS FROM MID-CHORD OFFSET AND**  
**PROFILOMETER MEASUREMENTS**

In the presence of a load, the mid-chord offset (MCO) and profilometer will see the vertical rail geometry (profile) in different perspectives. The former is a distributed measurement of rail as seen at three points in space. The latter is a single point measurement. For uniform foundation and rail size, the effect of loading will appear as a bias in the MCO and will not affect the profilometer measurements at all. But in the presence of a discontinuity in the foundation or the rail, loading will introduce variations in MCO and profilometer measurements. An analytical expression has been derived to evaluate the effect of loading on MCO and profilometer measurements in the vicinity of a discontinuity in the subgrade system. Based on this analytical model, the signature for such a transition was derived. This is compared with actual differences observed in track data. Initial results indicate that this method has a good potential for determining sudden changes in track stiffness.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

Talapatra, DC (ENSCO, Incorporated); Corbin, JC  
Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 512-517

ACKNOWLEDGMENT: EI (EIX770200047)  
ORDER FROM: ESL

**01 152792**  
**GYROSCOPICALLY COMPENSATED VERTICAL PENDULUM**  
**FOR MEASURING GUIDEWAY CANT FROM A MOVING**  
**VEHICLE**

A complete dynamic analysis is carried out for the gyroscopically compensated vertical pendulums used in the railroad test cars built by A. J. Amsler and Company and by Matisa. The analysis shows that the system may become unstable in certain speed ranges and that complicated damping schemes are required to maintain the stable behavior of the system. A modified design concept is presented which mathematically improves the basic Amsler concept and results in a system which would be simpler to implement and would exhibit a uniformly stable dynamic behavior for all speeds. The system can be employed in a moving vehicle that measures guideway cant (or superelevation), and it will be capable of maintaining a vertical reference that is unaffected by grade, vehicle curving, or vehicle speed variations.

Presented at the IAS (IEEE Industrial Applications Society) 10th Annual Meeting, Conference Record, Sept. 28-Oct. 2 1975, in Atlanta, Georgia.

Yang, TL (ENSCO, Incorporated)  
Institute of Electrical and Electronics Engineers, (75CH0999-31A) Conf Paper 1975, pp 523-526

ACKNOWLEDGMENT: EI (EIX770200049)  
ORDER FROM: ESL

01 152807

**DEVELOPMENT OF ULTRARAPID-HARDENING  
CEMENT-ASPHALT MORTAR FOR GROUTED-BALLAST  
TRACK STRUCTURE**

A new ultrarapid-hardening cement-asphalt mortar as viscoelastic material for the grouted-ballast track structure which will render the existing railroad lines maintenance-free has been developed. Its various characteristics have been investigated in various experiments to make it practically available. Ballast applicability, efficient work method and appropriate measures for correction of track irregularities have been established.

Harada, Y *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 1, Mar. 1976, pp 6-11

ACKNOWLEDGMENT: EI (EIX770200126)

ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

01 153054

**THE LONG ISLAND BUILDS A HIGH SPEED RAILROAD**

The latest upgrading activities of the Long Island Railroad are outlined: crossing protection, crossing elimination, extensive track rehabilitation, and an automatic speed control system. The virtually maintenance-free installation of concrete slab track laid on compacted embankments is also described.

*Progressive Railroading* Vol. 20 No. 3, Mar. 1977, pp 48-50, 9 Phot.

ACKNOWLEDGMENT: CNR

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

DOTL JC

01 153058

**COMPLETE TIE RENEWAL**

The topic of 100% tie renewal work in conjunction with mainline track rehabilitation is discussed. Besides the increased durability of the thus rehabilitated trackage, there are economic benefits derived by cascading the reusable ties to lower density lines.

*Progressive Railroading* Vol. 20 No. 3, Mar. 1977, pp 68-69, 4 Phot.

ACKNOWLEDGMENT: CNR

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

DOTL JC

01 153364

**PROSPECTUS: CROSSTIE MANUFACTURING,  
NORTHEASTERN AREA STATE AND PRIVATE FORESTRY  
COOPERATIVE FORESTRY RESOURCE USE**

No Abstract.

Forest Service A 13.2:C 88, 1976, 32 pp, Figs., Tabs., Refs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: Forest Service, Independence Avenue, Between 12th and 14th Streets, SW, Washington, D.C., 20250

01 153367

**U.S.-U.S.S.R. TRACK AND RAIL METALLURGY INFORMATION  
EXCHANGE**

The report covers track research and development activities, rail metallurgy and the technology of laying welded rail, assembly and disassembly of track panels and wood tie reclamation. It draws upon the experiences, observations and discussions of a seven-man team of engineers, researchers, and metallurgists who visited the Soviet Union during an 11-day period in 1976. The basic goals were to expand upon the knowledge obtained by previous delegations and to learn as much as possible for application or modification to US research and development activities and track maintenance procedures.

The exchange was coordinated by the U.S. DOT's Office of Policy, Plans and International Affairs and the Soviet State Committee for Science and Technology. This report was sponsored by the FRA's Office of Research and

Development and the USSR Ministry of Railways.

Beck, RF

Elgin, Joliet and Eastern Railway Company Final Rpt. FRA/  
ORD-77/19, Mar. 1977, 140 pp, 63 Fig., 2 Tab., 3 App.

Contract P.O. No. 74276

ACKNOWLEDGMENT: FRA, NTIS

ORDER FROM: NTIS

PB-266368/AS, DOTL NTIS, DOTL RP

01 153369

**THE EFFECTS OF ACCELERATED BALLAST CONSOLIDATION**

The effects of accelerated ballast consolidation were tested on main-line tracks of the Boston and Maine, the Chessie, the Missouri Pacific, the Penn Central and the Saint Louis and Southwestern, and at three sites on the Southern. Tests were made before and after traffic, after surfacing and related track work had been completed, both with and without machine consolidation of the ballast in the cribs and shoulders. The resistance of individual ties and panels of track to lateral forces, track settlement under traffic, and other indicators of track stability were measured. The average lateral resistance before traffic in sections of track with consolidated ballast was found to be equivalent to that reached after more than 400,000 tons (360,000 metric tons) of traffic on track with unconsolidated ballast. Settlement was found to be less in consolidated ballast, especially at joints. The differences diminished under traffic but were still evident after many thousands of tons of traffic. Some of the test results were not conclusive because of wide variations in local conditions and other factors. However, the results indicate that accelerated consolidation of ballast will be a valuable addition to track surfacing work in areas where continuous welded rail has a high probability of buckling under temperature stress after the ballast has been disturbed.

Sponsored by the FRA's Office of Research and Development, U.S. DOT. Other railroads participating in this work were the Boston and Maine Corporation, Penn Central Transportation Company, St. Louis and Southwestern Railway Company, and the Missouri Pacific Railroad Company.

Cunney, EG May, JT Jones, HN

ENSCO, Incorporated, Southern Railway Company, Chessie System, (DOT-FR-76-02) Final Rpt. FRA-OR&D-76-274, Mar. 1977, 184 pp, Figs., Tabs., 12 Ref., 5 App.

Contract DOT-FR-54174

ACKNOWLEDGMENT: FRA, NTIS

ORDER FROM: NTIS

PB-266447/AS, DOTL NTIS, DOTL RP

01 153373

**TOWARD BETTER EVALUATION OF RAILROAD BALLAST  
AGGREGATE**

The National Crushed Stone Association undertakes research aimed toward providing its producer members with authentic information on ways their products may be used to best advantage. One such investigation is attempting to develop simple laboratory methods of evaluating the quality of aggregate for use as railroad ballast. This current effort began in 1973, when Committee 1 of AREA sought information on the possible effect of changing the method of test for abrasion loss from ASTM Standard Method C 131 to Standard Method C535. Of the total of 34 samples included in this summary, 16 were tested in 1973 and 74, and the results reflect only the C 535 abrasion losses and some of the properties of the fines created. The complete program, including more extensive testing on 18 additional samples obtained in 1976 and 77 (all samples from sources known to have been supplying ballast to operating railroads) is described.

Nichols, FP, Jr

National Crushed Stone Association Res. Rpt. Apr. 1977, 4 pp, 1 Tab.

ACKNOWLEDGMENT: National Crushed Stone Association

ORDER FROM: National Crushed Stone Association, 1415 Elliot Place, NW, Washington, D.C., 20007

DOTL RP

01 153385

**MADRID-BARCELONA STANDARD GAUGE LINE WILL BE DESIGNED FOR 300 KM/H**

Later this year RENFE expects to present the government with a detailed proposal to build a completely new standard gauge double-track route 728 km long linking Madrid, Zaragoza and Barcelona with the SNCF at Port Bou. Designed exclusively for use by lightweight passenger trains running at 300 km/h, the preliminary route includes 49 km on bridges and 61 km in tunnel including one under the centre of Barcelona. Technical investigations are being carried out into the use of British slab-track and overhead line equipment, as well as computer control of the driving function, using continuous communication with the trains.

Oliveros, F *Railway Gazette International* Vol. 133 No. 2, Feb. 1977, pp 53-56

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

01 153387

**A NEW METHOD FOR THE DETERMINATION OF THE BALLAST LAYER THICKNESS**

In this article, a new method is established for the determination of the thickness of a ballast layer; the fundamental bases of which are: The consideration that the tension on the underside of the tie is a function of the ballast thickness and of the carrying capacity of the infrastructure, as well as the inclusion of the dependancy relation existant between the deformation module of the ballast and the corresponding one to the platform on which it rests. [Spanish]

Lopez Pita, A *Revista A.I.T.* No. 13, Dec. 1976, pp 77-89

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Revista A.I.T., Asociacion de Investigacion del Transporte, Madrid, Spain

01 153801

**MECHANIZED MAINTENANCE IN TUNNEL**

Permanent way maintenance is difficult along lengths in tunnels and therefore expensive, but can only be mechanised to a small degree. In this article some of the modern machines which may be used to reduce the time of these operations and make them more economic, are described.

Haferkorn, F *Railway Engineer* Vol. 2 No. 2, Mar. 1977, pp 63-66, 7 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Engineer  
ORDER FROM: ESL

DOTL JC

01 156215

**INDUSTRIAL TESTS OF DIFFERENT TYPES OF THE TOP STRUCTURE OF PERMANENT RAIL TRACKS [Promyshlennye ispytaniya razlichnykh tipov verkhnego stroeniya postoyannykh zheleznodorozhnykh putei]**

An experimental open-pit mine rail track sector with different construction of its top structure has been built at the Sarbay open-pit mine of the Sokolovsko-Sarbayskiy Ore Dressing Combine in Kazakhstan. It is designed for tracks with inclinations of up to 60 per 1000 and axial loads on the rolling stock of up to 35 t. Industrial tests of timber and--both serially produced and experimental strengthened-- concrete sleepers laid on ballasts of different thickness have been staged. Results of experimental measurements of stresses in rails and sleepers, and of pressures on the basic area of the bed arising when the PE-2M traction unit moves over it are presented. [Russian]

Volkov, GM (Sverdlovsk Mining Institute, USSR); Kutkin, AA Popov, YV *Izvestiya Vysshikh Ucheb Zaved, Gornyi Zhurnal* No. 5, 1976, pp 100-102

ACKNOWLEDGMENT: EI (EIX770400281)  
ORDER FROM: ESL

01 156222

**ELECTRO-OPTICAL SENSOR FOR MEASURING RAIL GAGE**

A sensor is described that measures the gage in a plane five-eighths of an inch below the top of the rail heads (as per the DOT/FRA track standards).

The sensor can be mounted and can function on a railroad truck with no part of the sensor lower than three inches above the top of the rail heads. This eliminates the possibility of sensor damage due to interference with various track structures. A breadboard of the electro-optical gage sensor was constructed to demonstrate the feasibility of the concept. The light source was an RCA infrared (GaAs) injection-laser array. The total emitting region of this array was 150 X 0.08 mils, consisting of 12 individual diode emitting regions each 9 X 0.08 mils. This array essentially formed a line source which could be simply projected to form an appropriate slit-shaped beam of light. The detector system was a Reticon LC 600 line scan camera with a 256-element, linear photo-diode array. The camera had self-contained electronics for periodic scanning of the array to determine which diode(s) were illuminated above a predetermined threshold. Breadboard results were positive.

Cantor, C (ENSCO, Incorporated)  
Industrial & Scientific Conference Management, Inc Proceeding 1975, pp 528-529, 2 Ref.

ACKNOWLEDGMENT: EI (EIX770400128)  
ORDER FROM: ESL

01 156256

**TOWARDS A MORE STABLE BALLAST BED**

Development of a dynamic track stabilizing machine has been directed at assuring that track geometry remains proper over longer periods. By building up high lateral resistance the immediate risk of deformation or buckling is reduced and the greater stability achieved also allows speed destructions to be eliminated immediately after tamping, leveling and lining work has been completed. Extensive testing has shown dynamically stabilized track to be superior to non-stabilized track in virtually all respects.

Riessberger, K (Plasser (Franz) Bahnbaumaschinen-Industrieges) *Railway Gazette International* Vol. 133 No. 3, Mar. 1977, pp 99-102, 3 Fig., 1 Tab., 3 Phot., 8 Ref.

ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

DOTL JC

01 156868

**MEASUREMENT PLAN FOR THE CHARACTERIZATION OF THE LOAD ENVIRONMENT FOR CROSS TIES AND FASTENERS**

This report was prepared as a part of the Improved Track Structures Research Program sponsored by the Office of Rail Safety Research of the Federal Railroad Administration. The report is a planning document for a track measurement program to obtain data on the service loads and reactions of cross ties and rail fasteners. These data will be used to validate analytical models for predicting track response and to provide a statistical description of track loading for design and testing improved cross ties and fastener assemblies. The report includes criteria for site selection, an evaluation of measurement parameters, instrumentation and data analysis techniques, and the development of statistical criteria for planning the measurement program.

Funded by the FRA/U.S. DOT through the Transportation Systems Center; the Bechtel Corporation served as subcontractor.

Prause, RH Harrison, HD Arnlund, RC  
Battelle Columbus Laboratories, Bechtel Corporation, (DOT-TSC-FRA-77-9) Intrm Rpt. FRA/ORD-77/03, Apr. 1977, 88 pp, Figs., Tabs., 8 Ref., 1 App.

Contract DOT-TSC-1044

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

BP271393/AS, DOTL RP

01 156874

**RAILWAY SWITCH PROTECTION BY A HIGH VELOCITY AIR CURTAIN**

The background leading to the development of the "Horizontal Air Curtain Switch Protector" is outlined. A comparison of the energy necessary to protect a switch from snowfall and that required to melt and/or vaporize snow with a switch heater is discussed. The laboratory tests and the field

tests on the first experimental air curtain in Ottawa and Montreal were sufficiently encouraging to extend the field tests. Following the second winter of field trials a more advanced design air curtain protector was installed in the CN Montreal classification yard. At the conclusion of the third winter of tests a decision was made by the CN to install ten units across the system for a more extensive evaluation of this switch protection system under different climatic conditions. The results from the field tests during the winter of 1975-76 are presented and some changes proposed as a result of this experience are outlined. This protection method offers economic advantages in terms of capital cost, energy operating cost and maintenance.

Presented at 4th Annual Sectional Meeting, Association of American Railroads, Communications and Signal Section.

Ringer, TR Dalton, CJ (Canadian National Railways) *Q Bull of Div of Mech Eng & Natl Aeronaut Estab DME/NAE* 1976(4), Dec. 1976, pp 1-10, 8 Fig.

ACKNOWLEDGMENT: National Research Council of Canada  
ORDER FROM: National Research Council of Canada, Montreal Road, Ottawa, Ontario K1A 0R6, Canada

DOTL JC

01 156897

#### QUALITY OF TRACK AS A CONSTRAINT ON THE SPEED OF TRAINS [Stan toru jako czynnik determinujący predkosć pociągów]

Speed of trains is analyzed on track segments with a deteriorated quality. A thorough study of the speed limits as safety measures is found to lead to considerable economy. A suitable description of the track quality is attempted as one of the safe speed criteria. [Polish]

Perykaszka, E (Politech Krakowska, Poland); Bronka, A *Archiwum Inzynierii Ladowej* Vol. 22 No. 4, 1976, pp 665-677, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

01 157217

#### TEST TRAIN PROGRAM. EIGHTH PROGRESS REPORT

This report describes the progress of the Rail Engineering and Test Support Program during the period July 1, 1975 to June 30, 1976. Primary emphasis of the program was to perform track inspection of heavily traveled mainline track for the FRA Office of Safety. Also described in this report are special tests performed for the FRA: improvements to the track measurement car and instrumentation; improvements and development of off-line data-processing techniques; development of analysis software for special FRA tests; and highlights of studies performed in support of the Rail Engineering and Test Support Program. This report is intended for use by management and technical personnel who are concerned with accomplishments of the Rail Engineering and Test Support Program.

Sponsored by the FRA/U.S. DOT, Office of Research and Development.

Peterson, C Gunn, W  
ENSCO, Incorporated, (DOT-FR-76-03) Prog Rpt. FRA-OR&D-77-25, June 1976, 109 pp

Contract DOT-FR-54174/64113

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-269938, DOTL NTIS, DOTL RP

01 157504

#### TURNOUT TECHNOLOGY

Higher wheel loads, tonnages and speeds, all of which increase the wear of switch points and frogs, and reduced budgets, which cause production maintenance forces to avoid them, have produced more pronounced deterioration of turnouts than of the general track structure. Railroads are undertaking rehabilitation programs and other measures to overcome what has become the weak link in track structures. Manufacturers are responding to trends to weld frogs and turnouts in welded rail territory. Manganese frogs for mainline use, longer switch-point rails and new guard rails are being introduced. Changes in design by Canadian Pacific and French National Railways are described. The Illinois Central Gulf's experience with dual-operator switch tampers is discussed. Finally, turnouts engineered to increase ride comfort, reduce maintenance and adapt easily to welded rail technology have been produced for the Taiwan Railway Administration and are seen as applicable in the U.S.

*Railway Track and Structures* Vol. 73 No. 6, June 1977, pp 16-27, Photos.

ORDER FROM: ESL

DOTL JC

01 157505

#### RAIL GUIDE-WHEEL ATTACHMENTS: THEIR ORIGIN, PROGRESS AND PROBLEMS

Adaptation of rubber-tired equipment for on-track use is traced from its beginning to the present, including the difficulties created by trend to wider tread widths by vehicle manufacturers. The author concludes that rail-wheel attachments have stabilized and that further changes due to altered vehicle designs are unlikely.

Cors, BE (Santa-Fe Railway) *Railway Track and Structures* Vol. 73 No. 6, June 1977, pp 28-31, Photos.

ORDER FROM: ESL

DOTL JC

01 157517

#### THE CHOICE OF CANT VALUES ON LINES WITH MIXED TRAFFIC [Die Auswahl des Ueberhoehungswerts bei Strecken mit gemischtem Verkehr]

No Abstract. [German].

Megyery, J *DET Eisenbahntechnik* Vol. 25 No. 2, Feb. 1977, pp 74-75, 1 Fig., 1 Tab., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

01 157519

#### FOR THE BIG CARS, WHAT KIND OF TRACK?

Considerations on the service life of rails over which increasingly heavy cars travel and on the prospects for improving steel used for rails. It would seem that the advantages of using very heavy cars are cancelled out by the cost of replacing rails when the weight of cars moved over them exceeds 100 tons.

Welty, G *Railway Age* Vol. 178 No. 5, Mar. 1977, pp 24-26

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

DOTL JC

01 157528

#### PERMANENT WAY. RAILWAYS RESEARCH SLAB TRACK

Account of tests on slab track carried out by several railways: JNR, BR and SNCF.

*International Railway Journal* Mar. 1977, pp 15-23, 10 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Simmons-Boardman Publishing Corporation, 508 Birch Street, Bristol, Connecticut, 06010

DOTL JC

01 157553

#### INFLUENCE OF THE LOAD DISTRIBUTION DIAGRAM ON RAIL ENDURANCE [Vliyanie shemy priloznija nagruzok na kontaktnuju vyinoslivost' rel'sov]

This article analyses the amount of rail deformation in the contact areas, studies the influence of the load distribution diagram on the fatigue strength of rail steel in the contact area, and explains the causes behind the worst defects that develop on corners. [Russian]

Jakovlev, VF Kudrjavcev, IA *Vestnik Vniizt* Vol. 36 No. 1, 1977, pp 33-36, 8 Fig., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

01 157596

#### AN ANALYSIS OF THERMAL TRACK BUCKLING IN THE LATERAL PLANE

The post-buckling equilibrium states are determined analytically. To obtain a consistent formulation of the problem, use is made of the principle of



virtual displacements and the variational calculus for variable matching points. The obtained formulations are nonlinear, but can be solved exactly. Solutions are presented for four buckled configurations. The results are presented graphically for a typical railroad track now in use on main lines. The obtained results are compared with the corresponding results of other investigators.

Sponsored by the FRA/U.S. DOT, Office of Research and Development; DOT's Transportation Systems Center acted as support agency.

Kerr, AD  
Princeton University, (DOT-TSC-FRA-76-17) FRA-OR&D-76-285,  
Sept. 1976, 70 pp, 12 Fig., 5 Tab., 12 Ref.

Contract DOT-TSC-900

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

01 157668

#### THERMIT WELDING OF RAIL STEELS

British Railways R&D has investigated the welding of rails by the thermit process. This article discusses the importance of correct square-cut rail gaps, preheating and correct tapping to insure slag separation. Two processes are discussed--the short-preheat technique being particularly suitable for high-tensile steels.

Ashton, ME (British Railways Board Research Department) *Railway Engineer* Vol. 2 No. 3, May 1977, pp 40-45, Figs.

ORDER FROM: ESL

DOTL JC

01 157675

#### WELDING RAILWAY TRACKS FOR INDUSTRIAL TRANSPORT

The Kommunarsk Steel Works has 200 km of intensively used industrial track where axle loadings are over 55 tons and the layout includes steep grades and sharp curves. While trains operate at only 25 km/hr, the trackage has been welded into 100-m lengths by a portable electric machine. Welds have been examined; the metallurgy of the joints and weld effects are described. Track maintenance has been reduced.

Translation of *Automaticheskaya Svarka*, N8, 1976, pp 48-49.

Shekhter, Sya Pyatkov, YuN Yusimov, SI (Kommunarsk Steelworks) *Automatic Welding* Vol. 29 No. 8, Aug. 1976, pp 36-37, 5 Ref.

ORDER FROM: Welding Institute, Abington Hall, Abington, Cambridge CB1 6AL, England

01 157702

#### A BIBLIOGRAPHY ON RAIL TECHNOLOGY

This rail technology review provides assistance to a number of rail technology programs initiated by the Transportation Systems Center (TSC) for the Federal Railroad Administration (FRA). The results of a search and review in four specific areas in the field of rail technology are presented in the form of a bibliography with descriptive abstracts, source acknowledgments, and availabilities. The geographic scope of the review was worldwide with particular emphasis on the literature of the United States, Canada, the United Kingdom, Western Europe, the Soviet Union, and Japan. The technical scope of investigations for which abstracts are presented include such important topics as the nondestructive examination of rails, the determination of rail stresses and strains and factors affecting them, rail failure behavior and the analysis of rails-in-service, and the metallurgical aspects of rail steel and its production. The time period covered by the review is 1965 through 1975, with particular emphasis on the past five years. Types of literature covered include: journal articles, conference papers, reports, textbooks, handbooks, and unpublished papers. Indices for the identification of the abstracts are

Sponsored by the FRA/U.S. DOT, Office of Research and Development, through the DOT Transportation Systems Center, under Interagency agreement with the Defense Supply Agency, Dayton, Ohio 45444.

Chapin, WE King, RD Pestel, HC Breslin, RH  
Battelle Columbus Laboratories, (DOT-TSC-FRA-76-28) Final Rpt.  
FRA/ORD-77/15, May 1977, 538 pp, 1526 Ref.

IA RA-75-19

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

01 157920

#### ENVIRONMENTAL PROTECTION AND TRACK INSTALLATIONS [Umweltschutz in Gleisanlagen]

The author explains how prefabricated rail support slabs can contribute to preventing water pollution. He also discusses the economic aspects of track installations designed to resolve environmental pollution problems. [German]

Spiegel, W *Eisenbahningenieur* Vol. 28 No. 1, Jan. 1977, pp 28-31, 2 Fig., 5 Phot.

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

01 157922

#### THE BALLAST COEFFICIENT AND ITS APPLICATION IN A STUDY ON THE MECHANICAL PROPERTIES OF TRACK [El coeficiente de balasto y su aplicacion al estudio de la mecanica de una via ferrea.]

This article sums up present know-how on the relationship between the Winkler coefficient, or track module, and the elements which make it up. [Spanish]

Lopez Pita, A  
Asociacion de Investigacion del Transporte No. 12, Oct. 1976, pp 53-68, 7 Fig., 12 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Asociacion de Investigacion del Transporte, Madrid, Spain

01 157927

#### SHINKANSEN TRACK MANAGEMENT SYSTEM

The Shinkansen Management Information System (SMIS) is a computer-based integrated system which receives the recordings made by a track inspection car running every 10 days at 210 km/h. It incorporates instructions for the inspection teams, and instructions for maintenance teams, processing information received in order to be able to monitor how track conditions are evolving.

Miyamoto, T Mochinaga, T *Japanese Railway Engineering* Vol. 16 No. 3/4, 1976, pp 8-11, 6 Fig.

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

DOTL JC

01 157929

#### CONCENTRATED RAIL RENEWAL WORK ON THE TOHOKU LINE

The 50 kg/m rails on the Tohoku line, were due for renewal after the passage of 400 to 500 million tonnes of freight. This renewal was not easy to carry out over a line handling more than 200 trains daily in each direction. In 1975, the replacement of old rails by 60 kg/m continuous welded rails was organized by introducing, in the train-path pattern, daily stoppages of 4 hours and a half during which 2 km of track were laid. Despite the highly sophisticated equipment used, the rail renewal operation over 32 km of track necessitated the presence of a force of 5000.

Inoh, T *Japanese Railway Engineering* Vol. 16 No. 3/4, 1976, pp 20-22, 6 Fig., 4 Phot.

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

DOTL JC

01 157955

#### PRODUCTIVITY: WHAT IS NEEDED TO GET THE MOST FROM TRACK GANGS?

This is an examination of the factors that determine the quantity and quality of work performed by track maintenance crews and what has to be done to get maximum output, including a plan for development of machines that will permit substantially increased output.

Fox, J (Canadian Pacific) *Railway Track and Structures* Vol. 73 No. 4, Apr. 1977, pp 17-19, Photos.

ORDER FROM: ESL

DOTL JC

01 157961

#### D&RGW PROLONGS TRACK LIFE

The Denver and Rio Grande Western is striving to increase the life of its track under increasingly heavy loads of unit coal trains. Continuous welded rail, curve oilers, rail grinding, high-silicon steel rail in curves and a precious-metal-slang ballast all have a role in extending the life of rail.

*Progressive Railroading* Vol. 20 No. 4, Apr. 1977, pp 34-36, 1 Fig., Photos.

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

DOTL JC

01 157966

#### MECHANISATION MINIMISES TRACK OCCUPATION

Dominating SZD track design and maintenance strategy is the need to minimize interruptions to traffic flow. Heat treatment is used to prolong rail life, and large end-loading tracklaying cranes permit rapid removal and replacement of complete panels while the adjacent track still carries traffic. On double-track lines machines may be concentrated so that several 2-km segments of track are replaced during a staggered sequence of six-hour occupations which takes advantage of one prearranged gap in the passage of trains.

Finitskyi, SJ (USSR Ministry of railways) *Railway Gazette International* Vol. 133 No. 7, July 1977, pp 267-269, 3 Fig., 1 Tab., 2 Phot.

ORDER FROM: ESL

DOTL JC

01 158185

#### THE DB'S NEW 1205 A AND B "SPENO" RAIL GRINDING TRAIN [Einsatz des neuen Schienenschleifzuges "Speno" DB 1205 A und B]

The article describes the design and equipment of the new Speno rail grinding train. It also mentions the planning necessary prior to using the train and the particular way in which it is used on level crossings and electro-magnetic treadle track. [German]

Jendrichowski, H *Eisenbahningenieur* Vol. 27 No. 12, Dec. 1976, pp 493-495, 1 Fig., 3 Phot., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Dr Arthur Tetzlaff-Verlag, Niddastrasse 64, Frankfurt am Main, West Germany

01 158198

#### NONDESTRUCTIVE MEASUREMENT OF LONGITUDINAL RAIL STRESSES

A study of the effect of applied stress on the wave velocity (acoustoelasticity) of railroad rail steel has shown that a potentially useful technique exists for the nondestructive measurement of longitudinal stresses. The detection of extreme stress levels would contribute toward increased rail safety by decreasing accidents due to track buckling and weld pull aparts in continuously welded rail. Velocity variations between various new rails and between new and used rails were found to be significant. The overall effect of this is expected to be minimized by either establishing a base line velocity profile for rail or by comparing the velocity change of two waves, each experiencing a different change with applied stress.

Egle, DM Bray, DE

Oklahoma University Intrm Rpt. FRA/OR&D-76-270, June 1975, 127 pp, Figs., Tabs., 36 Ref., 4 App.

DOT-OS-40091

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

PB-272061/AS, DOTL NTIS

01 158205

#### STRESSES AND DEFORMATIONS IN RAILWAY TRACK

An investigation conducted during the period May 1975-April 1976 to study the behavior of granular type materials used in railroad track is reported. The work entailed four sections: investigations of properties of ballasts, which include a preliminary petrological evaluation and permeability tests on the fines of 21 ballasts; triaxial static and repeated loading compression and extension tests on a dolomite ballast; model testing which consisted of testing a plane strain footing under repeated loading, and construction of a radially symmetric footing; and model testing of a full-scale railroad track tie under repeated loading.

Sponsored by the Transportation Research & Development Center, Canada, and the Canadian National and Canadian Pacific Railways.

Raymond, GP Lake, RW Boon, CJ

Canadian Institute of Guided Ground Transport Final Rpt. CIGGT-76-11, Nov. 1976, 171 pp, Figs., Tabs., 7 Ref.

Contract 101482

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

01 159492

#### RECORDING TRACK GEOMETRY AT SPEED

Techniques and equipment for measurement and assessment of track geometry from a high-speed vehicle by British Railways are described. This technique has been adopted by British Railways for acquiring research data on track deterioration, weld deterioration and comparisons of track maintenance machine performance, and, also as a means of acquiring data on track quality for the control of the maintenance activity. Mathematical models are presented for the calculation of vertical profile and horizontal curvature measuring system.

Lewis, RB (British Railways) *Railway Engineer* Vol. 2 No. 2, Mar. 1977, 7 pp, 4 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

01 159493

#### TRACK RELAYING MACHINE CUTS LINE OCCUPATION TIMES

A prototype SUZ500J track relaying train developed in Austria is described. The SUZ500J differs in principle from the earlier machines in that it removes the old track in panels. The design has been specifically developed to allow relaying work during short line possessions and downtime is only about 15 min. The machine works on the assembly line principle and consists of track panel remover, track tie laying unit, ballast grader, power unit, materials supply cars and a gantry crane.

*Railway Gazette International* Vol. 133 No. 1, Jan. 1977, pp 32-33

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

01 159494

#### DO TRACK-RENEWAL TRAINS HAVE A PLACE ON AMERICAN RAILROADS

The several forms in which such equipment is available are described, the cascading of ties made possible by the method is analyzed, and cost data are presented. A generalized analysis of this method of maintenance, including its potential for use in this country is presented.

Burns, DR *Railway Track and Structures* Vol. 73 No. 3, Mar. 1977, 9 pp

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

01 159664

**IS THE 100-TON CAR THE LIMIT OR WILL CAR WEIGHTS  
KEEP ON GOING UP?**

Panelists noted that, while problems created by present heavy cars have not been entirely overcome, further advances in technology will be required before heavier loads can be imposed on track.

*Railway Track and Structures* Vol. 73 No. 3, Mar. 1977, pp 50-54

ORDER FROM: ESL

DOTL JC

02 052908

**BRAKING AND ACCELERATION FORCES ON BRIDGES. MAGNITUDE AND DISTRIBUTION OF BRAKING AND STARTING FORCES IN THE TRACK**

This report describes tests made by the NS to ascertain the magnitude of the longitudinal forces during braking and their distribution in ballasted track. Measurements were taken during braking and starting of a locomotive on standard track. The tests confirmed that the greatest braking forces were produced at the moment the vehicle was stopped. Maximum value of the coefficient of friction during braking was  $\mu = 0.33$  and, that during starting,  $\mu = 0.37$ . It was also shown that a significant portion of the longitudinal force is transmitted through the rails and hence to the permanent way ahead and behind the locomotive. Comparison of corresponding values gave conditions similar to those determined by the D 71 Committee in another connection.

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

International Union of Railways D101/RP 1/E, Oct. 1969, 16 pp, 28 Fig., 14 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

02 053216

**BRAKING AND ACCELERATION FORCES ON BRIDGES AND INTERACTION BETWEEN TRACK AND STRUCTURE. BRAKING AND STARTING TESTS ON A CFF TWO-SPAN (2X15M CONTINUOUS BEAMS) CONCRETE BRIDGE BALLASTED TRACK**

The report gives results of measurements obtained in braking and starting tests on a two-span concrete bridge with continuous ballast bed, each span being 15 m. The distribution of braking and starting forces in abutments, piers, rails and ballast bed is shown.

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

International Union of Railways D101/RP 8/E, Apr. 1976, 39 pp, 15 Fig., 45 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

02 053218

**STATISTICAL DISTRIBUTION OF AXLE-LOADS AND STRESSES IN RAILWAY BRIDGES. STUDY OF PARAMETERS RELATING TO THE DYNAMIC LOADING OF RAILWAY BRIDGES AND MEASUREMENT OF THE INFLUENCE OF TRACK IRREGULARITIES**

The report gives an account of studies carried out by 3 railway administrations (CSD, DB, JNR) concerning the influence of different parameters on the dynamic loading of railway bridges as well as measurements of the influence of track irregularities at bridge mid-span made by 2 administrations (BR, DB). All studies are used to check the formula for the dynamic parameters recommended by the UIC Sub-Committee "Bridges".

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

International Union of Railways D128/RP 4/E, Apr. 1976, 37 pp, 52 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

02 143947

**DYNALIST II. A COMPUTER PROGRAM FOR STABILITY AND DYNAMIC RESPONSE ANALYSIS OF RAIL VEHICLE SYSTEMS. VOLUME III. TECHNICAL REPORT ADDENDUM**

Several new capabilities have been added to the DYNALIST II computer program. These include: (1) a component matrix generator that operates as a 3-D finite element modeling program where elements consist of rigid bodies, flexural bodies, wheelsets, suspension elements and point masses assembled on a nodal skeleton; (2) a periodic and transient time-history

response capability; (3) a component update capability for parametric studies; (4) an orthogonality check on component and system complex eigenvectors; (5) an option for improving low-frequency convergence under modal truncation; (6) a more general sine-amplitude forcing function capability; (7) automatic phase lag generation; (8) user-controlled scaling options on all response plots; and a number of additional minor improvements. A Technical Report Addendum and a completely revised User's Manual document these changes to the previous version of DYNALIST II.

See also PB-256 046 and PB-258 194.

Bronowicki, A Hasselman, TK  
Wiggins (JH) Company, Federal Railroad Administration,  
Transportation Systems Center Final Rpt. DOT-TSC-FRA-74-14-3, July 1976, 74 pp

Contract DOT-TSC-990

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-258193/2ST, DOTL NTIS

02 143948

**DYNALIST II. A COMPUTER PROGRAM FOR STABILITY AND DYNAMIC RESPONSE ANALYSIS OF RAIL VEHICLE SYSTEMS. VOLUME IV. REVISED USER'S MANUAL**

The Federal Railroad Administration (FRA) is sponsoring research, development, and demonstration programs to provide improved safety, performance, speed, reliability, and maintainability of rail transportation systems at reduced life-cycle costs. A major portion of these efforts is related to improvement of the dynamic characteristics of rail vehicles, track structures, and train consists. The Revised User's Manual reflects current modifications in output format which have been written into the Dynalist II program.

See also PB-258 193.

Bronowicki, A Hasselman, TK  
Wiggins (JH) Company, Federal Railroad Administration,  
Transportation Systems Center Final Rpt. DOT-TSC-FRA-74/14-4, July 1976, 156 pp

Contract DOT-TSC-990

ACKNOWLEDGMENT: NTIS  
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PB-258194/0ST, DOTL NTIS

02 146016

**SHOCK AND VIBRATION COMPUTER PROGRAMS. REVIEWS AND SUMMARIES**

Contents: Computer Programs--Multiple Energy Domain Systems, Transfer Function Analysis, Dynamics of Spacecraft Structures, Torsional Systems, Crash Simulation, Highway Vehicle Simulation, Cable Systems, Offshore Structures Analysis, Frames, Nonlinear Transient Response of Solids, Time Dependent Materials, Prediction of Highway Noise, Liquid Propellant Dynamics Analysis, Optimum Design of Dynamic Mechanical Systems, Mechanical and Thermal Shock Analysis, Random Vibration of Structures, Beams, Piping Systems, Dynamic Buckling of Structures, Limiting Performance of Structural Systems, Grillages, Kinematic and Dynamic Design of Mechanism, Seismic Analysis, Simulation of Human Body Response to Crash Loads, Test Data Reduction and Processing, Fluid Structure Interaction, Rotating Machinery, Aircraft Noise Prediction, and Shell Analysis; Capabilities and Routines within Programs--Summary of General Purpose Programs, Nonlinear Analysis Descriptions and Numerical Stability, Fracture and Fragmentation Under Shock Loading, Eigenvalue Extraction, Damping, and Inertia Matrices for Finite Elements; and Indexes--Subject Index of Shock and Vibration Computer Programs, and Alphabetical Index of Shock and Vibration Computer Programs.

Library of Congress Catalog Card no. 75-27337. Availability: Paper copy available from the Shock and Vibration Information Center, Naval Research Lab., Washington, D. C. 20375. \$25.00/Domestic; \$31.25/Foreign.

Pilkey, W Pilkey, B  
Virginia University SVM-10, 1975, 671 pp

Contract N00014-69-A-0060-001 (2)

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

AD-A030680/3ST, DOTL NTIS

02 146742

**AN INVESTIGATION OF DRAG REDUCTION ON BOX-SHAPED GROUND VEHICLES**

A wind tunnel investigation was conducted to determine the reduction in drag which could be obtained by making various configuration changes to a box-shaped ground vehicle. Tests were conducted at yaw (relative wind) angles of 0, 5, 10, 20, and 30 degrees and Reynolds numbers of 300,000 to 850,000. The power required to overcome the aerodynamic drag was reduced by a maximum of 73% for a head wind for the best configuration relative to the smooth bottom box-shape, or 75% relative to the rough bottom box-shape. The reduction for a 20 MPH wind at 30 deg to the vehicle path was, respectively, 77% and 79%. (Author)

Muirhead, VU

Center for Research, Incorporated Final Rpt. NASA-CR-1488-29, KU-FRL-180, July 1976, 94 pp

Grant NSG-4004

ACKNOWLEDGMENT: NTIS

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N76-32/27/2ST, DOTL NTIS

02 148583

**SIMULATION OF WAGON DERAILMENT**

To prevent freight car derailments caused by train-track dynamics problems, Japanese National Railways has developed a simulation incorporating the complex car and track phenomena. Computer studies have revealed causes and indicated countermeasures. This article describes a hybrid computation, combining digital and analog simulations. The results of simulation and actual tests are compared.

Matsuo, M (Japanese National Railways) *Japanese Railway Engineering* Vol. 16 No. 2, 1976, pp 14-16, 6 Fig.

ORDER FROM: ESL

DOTL JC

02 148588

**DESCRIBING FUNCTION TECHNIQUES FOR THE NON-LINEAR ANALYSIS OF THE DYNAMICS OF A RAIL VEHICLE WHEELSET**

The describing function method of analysis is applied to investigate the influence of parametric variations on wheelset critical velocity. In addition, the relationship between the amplitude of sustained lateral oscillations and critical speed is derived. The non-linearities in the model include the difference in rolling radii as a function of lateral displacement of the wheelset from its mean position, profile conicity, and gravitational stiffness in the lateral and yaw directions. The proposed method is validated by applying it to a wheelset example cited in the literature. Comparable results are obtained using the proposed technique. The describing function method presented in the report is quite general and is applicable to dynamic models exhibiting severe non-linear characteristics in profile. Critical speed, frequency of limit cycles, gravitational force, effective conicity, gravitational stiffness and creepage, etc., can be easily computed using the proposed algorithm.

Research was sponsored by the Federal Railroad Administration, DOT.

Garg, DP

Transportation Systems Center, (DOT-TSC-FRA-75-6) Intrm Rpt. FRA-OR&amp;D-75-83, July 1975, 102 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS

02 148589

**DYNALIST II, A COMPUTER PROGRAM FOR STABILITY AND DYNAMIC RESPONSE ANALYSIS OF RAIL VEHICLE SYSTEMS, VOLUME 2: USER'S MANUAL**

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.

Research was sponsored by the Federal Railroad Administration, DOT, under contract to the Transportation Systems Center, Cambridge, Massachusetts.

Bronowicki, A Hasselman, TK

Wiggins (JH) Company FRA-OR&amp;D-75-22.II, Feb. 1975, 100 pp, Apps.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

PB-257733/AS, DOTL NTIS

02 148602

**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 t 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 No. 8, Aug. 1976, pp 443-450, 2 Fig., 2 Tab., 11 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

DOTL JC

02 148610

**MODERN TECHNIQUES OF ANALYSIS IN TEST INSTITUTES EXPLAINED USING THE EXAMPLE OF HIGH-SPEED TESTS AT 250 KM/H [Die moderne Auswertetechnik bei den Versuchsanstalten dargestellt am Beispiel der Schnellfahrversuche bei 250 Km/h]**

No Abstract. [German]

Ostermeyer, M *Eisenbahntechnische Rundschau* Vol. 25 No. 4, Apr. 1976, pp 237-240, 2 Fig., 2 Tab., 5 Ref.

ACKNOWLEDGMENT: UIC

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

DOTL JC

02 148616

**ANALYSIS OF THE RUNNING QUALITY AS RELATED TO THE IRREGULARITY OF THE TRACK AND TO THE OSCILLATIONS OF THE BODY OF A RAILROAD VEHICLE [Analisi della qualita di marcia in relazione alle irregolarita del binario ed alle oscillazioni della cassa di un veicolo ferroviario]**

It is shown how by analyzing the results experimentally obtained by E. Sperling, and placing them in relation with the fatigue time of the vertical oscillations, the analytical determination of the running quality is reached in particular hypothesis. [Italian]

Giuffre, O (Faculty of Engineering of Palermo, Italy) *Giornale del Genio Civile* Vol. 114 No. 4/6, Apr. 1976, pp 155-164, 12 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

02 148816

**MAIN RESISTANCE TO FORWARD MOTION OF VERY HIGH-SPEED STREAMLINED TRAINS [Osnovnoe soprotivlenie dvizeniju vysokoskorostnyh poezdov horoso obtekaemoj formy]**

No Abstract. [Russian]

Sjuzjumova, EM Romanenko, GA *Vestnik Vniizt* Vol. 35 No. 6, 1976, pp 16-19, 3 Fig., 1 Tab., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Transport Publishing House, Basmannyi Tupik, 6a, Moscow B-174, USSR

**02 149384**  
**THE RHEOLOGICAL PROPERTIES OF SOLID RAIL CONTAMINANTS AND THEIR EFFECT ON WHEEL/RAIL ADHESION**

Low wheel/rail adhesion due to slightly wet rails caused by partial hydrodynamic lubrication of the wheel by a viscous mixture of iron oxides and water is discussed.

Beagley, TM (British Railways Technical Center, England) *Institution of Mechanical Engineers Proceedings* Vol. 190 No. 39, 1976, pp 419-428, 24 Ref.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**02 149385**  
**ON THE APPROXIMATE SOLUTIONS OF A BIQUADRATIC EQUATION FOR WHEELSET HUNTING AND ITS RUNNING**

The approximate solutions of a biquadratic equation for wheelset which are derived from the basic differential equations of the dynamic hunting of wheelset, are presented. By comparing with the numerical results using a digital computer with an approximate formula, it is clarified that the approximate solutions agree well with the exact values when the running velocity is less than that of the hunting velocity. Furthermore, the stability of the limit cycle for the wheelset hunting is described, and the criterion for the design of wheel tread profile subsisting in the stable limit cycle was obtained.

Yokose, K *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 2, June 1976, pp 73-77

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

DOTL JC

**02 149391**  
**TRACTION AND SLIP AT HIGHER ROLLING SPEEDS**

In order to investigate the relationship between traction and slip at higher rolling speeds, such as those encountered in wheel-rail contact, the authors have constructed a high-speed rolling machine. This paper deals with some results of experiments carried out under spindle oil and water lubrication on this machine. The traction coefficients for both spindle oil and water were found to increase with slip ratio linearly at first and then gradually rising to a maximum value. Thereafter, they decreased with slip in the case of spindle oil but remained almost constant in the case of water with increasing slip ratio below 2 or 3%. They seemed to reach maximum values with almost the same slip ratio regardless of rolling speed or contact pressure. [Japanese]

Maruyama, H (Railway Technical Research Institute); Ohyama, T Inada, S *Japan Society of Lubrication Engineers, Journal* Vol. 21 No. 7, 1976, pp 434-440, 7 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**02 149429**  
**MODIFICATIONS IN STRESS CONDITIONS UNDER THE BALLAST BED ACCORDING TO DIFFERENT SPEEDS OF A MOVING LOAD [Aenderungen des Spannungszustandes unterhalb des Schotterbettes in Abhaengigkeit von verschiedenen Geschwindigkeiten der bewegten Last]**

No Abstract. [German]

Firsak, Z *Eisenbahntechnische Rundschau* Vol. 25 No. 10, Oct. 1976, pp 630-631, 7 Fig., 4 Ref.

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

DOTL JC

**02 149435**  
**THE CHASSIS DYNAMOMETER AS A RESEARCH TOOL IN WHEEL/RAIL TECHNOLOGY [Rollpruefstand zur Erforschung der Rad/Schiene Technik]**

It is designed to simulate running conditions, traction and braking as well as the required track position and any deviation from this position, thus permitting the running performance of the vehicles and components to be tested under stationary laboratory conditions. The rail is simulated by rollers. The paper describes the degrees of freedom of the rollers used to simulate the track geometry and the appertaining design implementation as well as the representation of the tractive and braking efforts. The fundamental features of the structures and process control system are outlined too. [German]

Luebke, D von *Glaser's Annalen ZEV* Vol. 100 No. 10, Oct. 1976, pp 295-305, 14 Fig., 2 Tab., 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
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DOTL JC

**02 149436**  
**EXPERIMENTAL RUNNING GEARS FOR CHASSIS DYNAMOMETER TO INVESTIGATE THE WHEEL/RAIL SYSTEM [Versuchslaufwerke fuer den Rollpruefstand zur Erforschung des Rad/Schiene-Systems]**

To support the simulation of the running performance of high-speed rail vehicles by the results of actual tests, the most important parameters of the vehicles must be variable within a wide range and separately. It was thus an obvious conclusion to develop and build special running gears which are exclusively designed for tests on the chassis dynamometer. The authors describe in detail the supporting and guiding elements and other components as well as the experimental running gears. [German]

Ditting, G von Laukotka, E *Glaser's Annalen ZEV* Vol. 100 No. 10, Oct. 1976, pp 306-314, 10 Fig., 4 Ref.

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

DOTL JC

**02 149954**  
**THE STUDY OF SLIDE CONTROL SYSTEM AT HIGH SPEED RUNNING**

The article criticizes this slide control system, stresses its defects and suggests the definition of a new system including detection of micro sliding and close control of brake force under an adhesion limit.

Shirai, S *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. N1, Mar. 1976, pp 45-46, 3 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

DOTL JC

**02 149963**  
**CROSS ACCELERATION IN COMBINED TRANSPORT [Seitenbeschleunigungen im kombinierten Ladungsverkehr]**

The Federal Transport Minister and the DB have asked the Institute for Vehicle Technology at the Brunswick Technical University to study the stability of road vehicles on low-deck cars and that of containers and swap bodies on various DB cars. Measurements have been made for various speeds on first and second category DB lines. The author reports the results obtained and draws conclusions. [German]

Mitschke, M *Eisenbahntechnische Rundschau* Vol. 25 No. 1, Nov. 1976, pp 700-703, 4 Fig., 3 Tab., 12 Ref.

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

DOTL JC

02 150482

**PRELIMINARY ANALYSIS OF THE EFFECTS OF NON-LINEAR CREEP AND FLANGE CONTACT FORCES ON TRUCK PERFORMANCE IN CURVES**

Prediction of wheel displacements and wheel-rail forces is a prerequisite to the evaluation of the curving performance of rail vehicles. This information provides part of the basis for the rational design of wheels and suspension components, for establishing criteria for maintenance of track and wheels, for use as a guideline for safety standards, and for understanding the mechanism of noise generation and wheel-climbing. The analysis presented here extends the results from linear steady-curving appropriate to flangeless guidance, and provides a foundation for the examination of the details of forces and displacements under more severe conditions necessary to the understanding, prevention, and suppression of undesirable effects.

Perlman, AB Weinstock, H  
Transportation Systems Center, Federal Railroad Administration Intrm  
Rpt. DOT-TSC-FRA-75-5, FRA/ORD-75/56, May 1975, 42 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262177/9ST, DOTL NTIS

02 151218

**NON-DESTRUCTIVE IMPACT BETWEEN RAILROAD CARS: EXPERIMENTAL AND ANALYTICAL STUDY**

A computer simulation of the dynamics of rail car impacts is compared with experimental data obtained from full scale switchyard impacts. The compared cases involve impacts between a standing light hopper car and a moving, fully loaded tank car at speeds ranging from 2 mph to 8 mph. The monitored dynamic responses include vertical car motions, draft gear travel, longitudinal coupler forces, car body accelerations, and vertical bolster loads.

Peters, DA Yin, SK  
Washington University, St Louis, Federal Railroad Administration Tech.  
Rpt. FRA/ORD-76-247, Jan. 1977, 65 pp

Contract DOT-OS-40106-2

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263187/7ST, DOTL NTIS

02 152412

**EFFECTS OF THE WEIGHT TRANSFER OF A LOCOMOTIVE DURING BRAKING ON WHEEL SKIDDING [Vlijanie razgruzki oseb lokomotiva pri tormozenii na zaklinivanie ego koles]**

No Abstract. [Russian]

Terezchenko, VP Kuz'mina, EI *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 34-38, 2 Fig., 1 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: *Vestnik Vniizt*, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

02 152414

**SPECTRAL ANALYSIS OF VERTICAL ACCELERATION IN AN AXLE-BOX OF A COACH ON AN ER 200 ELECTRIC TRAIN**

No Abstract. [Russian]

Brzevovskij, AM Savos'kin, AN *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 14-18, 4 Fig., 4 Tab., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: *Vestnik Vniizt*, 3-aya Mytishchinskaja ul. 10, Moscow I-164, USSR

02 152422

**WHEEL/RAIL VERTICAL FORCES IN HIGH-SPEED RAILWAY OPERATION**

The nature and magnitude of the vertical forces between a railway vehicle wheel and the rail at a dipped rail joint is investigated using methods developed by British Rail. The dependence of these forces on the unsprung weight is determined and a procedure is given for the specification of new equipment to insure that the principal wheel/rail forces at higher speeds will not exceed those of a reference vehicle at conventional speeds.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Radford, RW (Canadian National Railways)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-1,  
Mar. 1977, 10 pp, 22 Fig., 3 Tab., 2 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

02 152423

**EFFECT OF TRACK GEOMETRY AND RAIL VEHICLE SUSPENSION ON PASSENGER COMFORT IN CURVES AND TRANSITIONS**

Passenger comfort is an important constraint on high-speed operation in curves and transitions. The effect of track geometry and vehicle suspension characteristics on passenger comfort were investigated with a six-degree-of-freedom, time domain simulation of the car body dynamics. The rail vehicle was simulated at constant speed on transitions and curves to generate acceleration profiles at a passenger's seat location. The main conclusion of this study is that modern rolling stock can negotiate curves at a higher unbalanced superelevation than is recommended in the current AREA formula without exceeding passenger comfort standards. Also, the minimum spiral lengths as determined by the AREA formula are adequate for passenger cars with stiff roll characteristics, such as the Metroliner vehicles.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Doyle, GR, Jr (Battelle Columbus Laboratories); Thomet, MA  
(Bechtel Corporation)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-2,  
Mar. 1977, 8 pp, 8 Fig., 3 Tab., 16 Ref.

ACKNOWLEDGMENT: ASME  
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DOTL RP

02 152424

**DYNAMIC SIMULATION OF FREIGHT CAR AND LADING DURING IMPACT**

A dynamic analysis is presented to explain damage to railroad cars and loadings 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.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Kasbekar, PV Garg, VK Martin, GC (Association of American Railroads)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-3,  
Mar. 1977, 8 PP, 21 Fig., 1 Tab., 12 Ref.

ACKNOWLEDGMENT: ASME  
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02 152427

**DEVELOPMENT OF A SIMULATION METHODOLOGY FOR OPTIMIZING LOCOMOTIVE SUSPENSION SYSTEMS**

The dynamic response of a six-axle locomotive subjected to vertical and/or lateral track irregularities is analyzed by a 30 degree-of-freedom locomotive model. This model, which is currently partially validated, will soon be available to Track-Train Dynamics participants. The hunting speeds of the locomotive, and variable relative stiffnesses between primary and secondary suspensions, are evaluated using a 21 degree-of-freedom, Lateral Stability Model. The effects of primary and secondary suspension stiffness on the dynamic and tractive characteristics of the locomotive are studied. A methodology for selecting the primary and secondary locomotive truck suspension stiffnesses, which provide "optimum" tractive effort and minimize the undesirable behavior, is presented.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Garg, VK Hawthorne, KL Chang, EH Hartmann, PW (Association of American Railroads Technical Center)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-6,  
Mar. 1977, 13 pp, 15 Fig., 2 Tab., 8 Ref., 1 App.

ACKNOWLEDGMENT: ASME  
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→ 02 152431

### PLANNING THE FACILITY FOR ACCELERATED SERVICE TESTING

This paper describes the planning of the "first" experiment, that is, the first several months of operation of the Facility for Accelerated Service Testing, built at the Department of Transportation's Test Center in Pueblo, Colorado. The Facility for Accelerated Service Testing is a 4.8-mile track loop over which a 9500-ton train operates for up to 16 hr per day. By performing this operation, the track is subjected to a million gross tons per day and the vehicles travel up to 640 miles per day. Three hundred days of operation per year will subject the track to 300,000,000 gross tons and the vehicles traverse approximately 200,000 miles. This represents a tenfold increase in the amount of traffic to which the track is subjected and the amount of mileage the vehicles travel over normal revenue service. The track, consisting of 22 different track test sections and mechanical tests in 13 component areas, enables evaluation of various track constructions and mechanical equipment ten times sooner than would have been possible in actual revenue service. The entire project was realized in less than one year because of the enthusiastic cooperation by the Federal Railroad Administration, the railroad and railroad supply industry, the Railway Progress Institute, the Association of American Railroads, and the Transport Development Agency of Canada.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Martin, GC Lundgren, JR Punwani, SK (Association of American Railroads Technical Center)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-10,  
Mar. 1977, 11 PP, 11 Fig., 5 Tab.

ACKNOWLEDGMENT: ASME  
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DOTL RP

02 152432

### GRAPHICAL OUTPUT-ORIENTED COMPUTER MODEL OF A RAILROAD FREIGHT CAR WITH CONVENTIONAL TRUCKS

The paper describes a 13-degree-of-freedom, frequency domain, computer model of a railroad freight car riding on conventional North American three-piece trucks. These 13 degrees of freedom incorporate roll, pitch, bounce, bending, and twisting of the body, as well as lateral, swivel, and parallelogramming of each truck. This idealized freight car is driven at 200 discrete frequencies from 0.1 to 20.0 cycles per second. The driving functions are derived from the Fourier components of track geometry measurements taken from actual test tracks. Although the model is linear, coulomb damping is approximated by equivalent viscous coefficients at each frequency. Printed output is provided; however, the basic product of the program is a series of two-color graphs produced on a mechanical plotter. These include a Nyquist diagram, giving indications of the freight car's lateral stability on tangent track, and PSD plots illustrating the frequency breakdown of the various vehicle responses. Comparisons are made between the computed PSD plots and actual test data for specific conditions.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Luttrell, NW (Southern Pacific Transportation Company)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-11,  
Mar. 1977, 12 pp, 20 Fig., 3 Tab., 5 Ref.

ACKNOWLEDGMENT: ASME  
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DOTL RP

02 152433

### CONTROLLING SLACK ACTION IN A UNIT TRAIN

Slack action in long railroad trains can give rise to damaging longitudinal forces. This paper develops criteria for the occurrence of unplanned slack action in a unit train on a gradient change. It is shown that remote-controlled locomotives at the rear of the train can substantially reduce the incidence of such slack action. This is achieved by maintaining a unimodal draft force profile throughout the train. From these results it is suggested how a train driving schedule could be determined for a particular run by considering the train parameters and the profile of the route.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Kerr, AJ (University of Western Australia, Nedlands)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-12,  
Mar. 1977, 8 pp, 5 Fig., 6 Ref., 1 App.

ACKNOWLEDGMENT: ASME  
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DOTL RP

02 152617

### SERIES OF MEASUREMENTS ON A RAILWAY AXLE WITH INDEPENDENT WHEELS

A description is given of the technique adopted to measure the real running conditions and the relative and absolute angular positions of two wheels of a railway axle fitted with independent wheels. The measurements are carried out by the Institute of Transport of the Faculty of Engineering in Rome, with the Contribution of CNR, in collaboration with STEFER. [Italian]

Malavasi, G *Ingegneria Ferroviaria* Vol. 31 No. 9, Sept. 1976, pp 19-26

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

02 152619

### METHOD TO DETERMINE THE EFFECTS OF VERTICAL FORCES BETWEEN WHEEL AND RAIL AND LOCOMOTIVES

A method for measuring the effect of vertical forces between wheel and rail is described. The wheel bodies are directly used as transducers, with the elastic deformation arising in the wheel treads at certain points of the wheel body surface, which is typical of the effects of these forces, being measured with strain gauges. The set-up of the measuring circuit, the development from the four-point measuring method to a nearly continuous output signal and possible errors in measurement are outlined. The method which has so far been applied on the No. 103 118 locomotive is still developable. [German]

Dorfler, E *Glaser's Annalen ZEV* Vol. 100 No. 12, Dec. 1976, pp 361-366

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

02 152620

### GROUND PRESSURE MEASUREMENTS DURING HIGH-SPEED TRIALS BETWEEN GUETERSLOH AND NEUBECKUM

The results of the ground pressure measurements performed by Deutsche Bundesbahn in connection with the high-speed trials between Gutersloh and Neubeckum may be summarised as follows: Each wheelset or, in case of a concrete-slab permanent way, each bogie causes a pressure peak when running over the load cells. With ballast permanent ways, the vertical pressures rise with the speed, this effect being less pronounced in case of the horizontal ground pressures. The vertical ground pressures measured are below 10 N/sq cm for a Series 103 electric locomotive (axle load 19.5 tonnes), the scatter being comparatively large. In the upper range of wooden sleeper installations the ground pressures are slightly higher than below concrete sleepers. From a depth of 120 cm, both types of sleepers render comparable ground pressures. With concrete-slab permanent ways, the ground pressures vary only slightly and are considerably smaller than below ballast beds. The vertical pressures measured are below 3 N/sq cm for a Series 103 electric locomotive (axle load 19.5 tonnes), the scatter being comparatively small. Judging by the test results, it may be anticipated that the requirements in respect of the bed and the formation line as laid down



in DB's earthwork engineering rules for new lines will ensure an unobjectionable operation. [German]

Martinek, K. *Glaser Annalen ZEV* Vol. 100 No. 12, Dec. 1976, pp 367-372

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

02 152630

**CONTINUOUS APPROACH METHOD FOR ESTABLISHING THE DYNAMIC CHARACTERISTICS OF A RAIL VEHICLE ON THE BASIS OF EXPERIMENTAL DATA** [Identifikacija parametrov zeleznodoroznogo vagona po eksperimental'nym dannym]

The article describes this method for calculating the following parameters: Rigidity of spring suspension, rigidity in respect to body deflection, and dissipation of energy in the spring suspension and the body. [Russian]

Uskalov, VF *Vestnik Vniizt* 1976, pp 31-36, 4 Fig., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

02 152635

**VEHICLE/TRACK DYNAMICS: A CAPITAL ASPECT OF RESEARCH INTO THE WHEEL/RAIL SYSTEM**

[Fahrzeug/Fahrweg-Dynamik: Schwerpunkt der Rad/Schiene-Forschung]

In the wheel/rail research work ordered by the GFR Ministry of Research and Technology, the track is assumed to be a structure subject to vibration. The author explains the three-phase research procedure: Theory, test bench, and line testing. He also touches on track/vehicle interaction and the economic limits of the wheel/rail system. [German]

Kuhla, E. *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 4/5, July 1976, pp 71-75, 4 Fig., 1 Tab., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

02 152636

**DEVELOPMENT AND CONSTRUCTION OF ROLLER RIGS FOR TEST BENCHES, AND PREPARING TEST PROGRAMMES**

[Entwicklung und Bau von Versuchslaufwerken fuer Pruefstandsversuche und Aufstellung der Versuchsprogramme]

No Abstract. [German]

Stiebeling, HH *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 4/5, July 1976, pp 83-88, 10 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

02 152637

**PRINCIPLES OF THE THEORETICAL TREATMENT TO VEHICLE-TRACK INTERACTION** [Grundsätze der theoretischen Behandlung des Zusammenwirkens von Fahrzeug und Fahrweg]

The author explains the problems in the theoretical treatment of the complex physical system of rail/wheel interaction, by means of a system with 17 degrees of freedom, which makes it possible to predetermine the running and maximum speed of vehicles by calculation, based on given track and vehicle data. [German]

Heinze, S. *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 4/5, July 1976, pp 76-80, 5 Fig., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

02 152660

**ROLL DYNAMICS UNIT AND VIBRATION TEST UNIT**

The Rail Dynamics Laboratory (RDL) permits evaluation of various car and locomotive designs in a safe, controlled and reproducible laboratory

environment with minimal risk to equipment and personnel. RDL houses two test machines, the Vibration Test Unit (VTU) and the Roll Dynamics Unit (RDU), along with necessary data collection, analysis and service facilities. RDU will be capable, through a system of drive motors, fly-wheels and rollers, of simulating relative rail motion under rail vehicles and absorbing power produced by self-propelled units. VTU will subject a stationary rail vehicle to controlled vertical and lateral vibration inputs at the wheel/rail interfaces through servo-controlled actuators. Physical capabilities of the subsystems of the laboratory are given. Facilities are available for government-and industry-sponsored research programs.

Direct requests to Mr. Arnold Gross, RDL Program Manager (RRD-11), FRA.

Federal Railroad Administration Brochure Nov. 1976, 13 pp, 2 Fig., 2 Tab., 4 Phot.

ACKNOWLEDGMENT: FRA  
ORDER FROM: FRA

DOTL RP

02 152778

**COMPUTATIONAL METHODS IN GROUND TRANSPORTATION**

This paper discusses the mechanics problems of crashworthiness, vehicle dynamics, train handling, and track structures and the computational methods for solving these problems.

Presented at the Computers in Applied Mechanics Symposium, ASME Winter Annual Meeting, in New York, New York, December 5-10, 1976.

Tong, P. *ASME Journal of Applied Mechanics* Vol. 18 1976, pp 117-138, 30 Ref.

ACKNOWLEDGMENT: EI (EIX770200015)  
ORDER FROM: ESL

DOTL JC

02 152791

**INSTRUMENTATION FOR DATA COLLECTION ON A REVENUE FREIGHT TRAIN**

Instrumentation systems for the measurement of railroad vehicle dynamics must be designed to survive the extreme environmental conditions to which they will be exposed. This paper describes the rigorous railroad environment and some of the techniques used to cope with it. Careful attention to the environmental constraints and precisely planned testing procedures will significantly increase the probability of a successful field test.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

Macintyre, SA (ENSCO, Incorporated); Kaufman, WM  
Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 518-522

ACKNOWLEDGMENT: EI (EIX770200048)  
ORDER FROM: ESL

02 153359

**2, 3, & 4 AXLE RIGID TRUCK CURVE NEGOTIATION MODEL. TECHNICAL DOCUMENTATION**

This study explains a technique by which the wheel/rail interaction associated with the negotiation of a section of curved track by a rigid-framed locomotive truck may be predicted, taking into consideration axle and individual wheel loads, operation at other than balance speed, tractive or braking effort, and train forces which may produce components at the truck center bearing.

See also RRIS 02 139449-50 7701.

Smith, KR (General Motors Corporation); MacMillan, RD Martin, GC  
Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Research and Development Center R-206, No Date, 78 pp, Figs., 8 Ref., 4 App.

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

DOTL RP

02 153361

**DYNAMIC FIELD TESTING ACTIVITIES**

The field testing conducted by the Track Train Dynamics Program as validation for mathematical models previously developed is described. A Southern Pacific road test in 1973 confirmed the various Train Action Models; 1974 tests at the Pueblo Transportation Test Center confirmed the Lateral Stability Models; L&N tests confirmed Vertical Train Stability Models. This manual explains what occurred during these tests and provides a description of the data obtained.

Association of American Railroads Technical Center, Federal Railroad Administration, Transportation Research and Development Center, Transportation Development Agency R-183, No Date, 538 pp, 109 Fig., 11 App.

ACKNOWLEDGMENT: AAR

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

DOTL RP

02 153362

**TRUCK AND CARBODY CHARACTERIZATION**

Martin Marietta Corp. has developed a mathematical model of an 80-ton hopper car and its Ride Control Trucks to be used to provide response information about curving, hunting and track irregularities. This report summarizes laboratory tests, analytical model derivation and comparative stability analyses. One objective was to develop a test/analysis philosophy to permit evaluation of the dynamic behavior of other truck/car configurations.

The report contains a reference section prepared by Clemson University, Department of Mechanical Engineering, under FRA/U.S. DOT contract DOT/OS/40018.

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Research and Development Center R-186, 84 pp, 23 Fig., 1 Tab., 3 App.

ACKNOWLEDGMENT: AAR

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

DOTL RP

02 153363

**CHARACTERIZATION OF DRAWGEAR SYSTEMS DURING COUPLER ANGLING**

This reference manual on lateral force characteristics of various types of draft gears and couplers under draft and buff loads during angling was developed as part of the Track-Train Dynamics Program. Data from these tests can be used in several TTD mathematical models, particularly the Lateral Train Stability Models. The dynamic interactions investigated are those produced by combinations of long and short cars, length of tangent between reverse curves, change in superelevation in spirals, and jackknifing tendencies for a variety of car combinations, track geometries and operating practices.

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Research and Development Center R-187, No Date, 73 pp, 43 Fig., 2 App.

ACKNOWLEDGMENT: AAR

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

DOTL RP

02 153390

**AN ELECTRICAL ANALOGUE SIMULATION OF THE VERTICAL DIRECTION OF VIBRATION IN RAILWAY VEHICLES**

This simulation of the elastic mechanical transmission channel of low-frequency vibrations up to about 16 c/s is based on the well-known Firestone analogy. The model representation of a rail vehicle as a spatially distributed point-mass arrangement with concentrated springs and dampers holds good, at the least in practice, for the forced-vibration mechanism of the vertical direction. Between the model amplitudes and those of real processes, correlation coefficients of 0.85 to 0.95 were attained above the bogies, which however, only gained 0.65 to 0.80 for the centre of the vehicle because proper deflection-vibration values are higher and cannot be determined by a

concentrated point-mass system. With increasing frequency the point-mass structures lose in sharpness of representation. By the installation described, the floor acceleration can currently be recorded as time functions from axle-bearing accelerations measured. [German]

Weishaupt, S *DET Eisenbahntechnik* Vol. 25 No. 2, Feb. 1977, pp 64-67

ACKNOWLEDGMENT: British Railways

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

02 154010

**COMPARATIVE ANALYSIS OF DYNAMICS OF FREIGHT AND PASSENGER RAIL VEHICLES**

Analytical studies have been conducted on several different rail vehicles typical of North American railroad operations. Mathematical models, and computer codes for the mechanization of these models, have been generated to provide a predictive methodology for determining vehicle/track dynamic interaction under a range of conditions. These models have been validated through comparison of results with test data from several of the rail vehicles. Results of a comparative analysis of nine different rail vehicles were presented in a Final Report (FRA-ORD&D-74-39) dated March 1974. In subsequent contract modifications, the analytical techniques were used to provide support to the Metroliner Ride Improvement Program (DOT-FR-20049). Both the vehicle ride comfort and truck hunting stability were investigated by means of computer simulation. Parameter variation studies were used to determine optimum suspension values for both ride comfort and hunting stability. The report provides a summary of work conducted under the original contract and five subsequent modifications. Recent modifications to the mathematical models to improve simulation accuracy are discussed. In addition, improvements in the representation of track geometry in power spectral density format based on recent measurements are discussed.

See also RRIS 02 090530, Bulletin 7502.

Ahlbeck, DR Doyle, GR, Jr

Battelle Columbus Laboratories, Federal Railroad Administration Summary FRA/ORD-77/04, Nov. 1976, 73 pp

Contract DOT-FR-20077

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265050/5ST, DOTL NTIS

02 154119

**DERAILMENT WARNING INDICATOR**

The patent application relates to a system for dynamically indicating to an engineer the maximum buff or draft force that can be applied without significant danger of derailment for all cases of quasi-steady grade and curve negotiation.

This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Brantman, R Vrabel, JD Sussman, ED

Department of Transportation Patent PAT-APPL-765-929, No Date, 26 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-263732/0ST, DOTL NTIS

02 154335

**COMPARISON OF THE NONLINEAR DYNAMIC CHARACTERISTICS OF BARBER S-2 AND ASF RIDE CONTROL FREIGHT TRUCKS**

The results of an experimental and analytical program to define the load deflection characteristics of a Barber S-2 freight truck and to compare these characteristics to those of an ASF freight truck of the same load capacity are presented. The comparison of the two trucks is made on a parameter basis and on the basis of the wheel/rail loads induced by track misalignment. The results indicate there is very little difference in the parameters and the response of the two trucks. This is of course qualified by the assumptions required in the development of the mathematical models.

Abbott, P

Martin Marietta Corporation NASA-CR-150113, MCR-76-475, Sept. 1976, 42 pp

Contract NAS8-29882

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

N77-13655/4ST, DOTL NTIS

02 154841

**GUIDEWAY-VEHICLE COST REDUCTION. PART I: GUIDEWAY-VEHICLE PERFORMANCE AND COSTS**

The cost and performance benefits of using improved suspensions in passenger railcars are investigated. Preliminary results from the first year of a two year study are presented. The primary objective is to determine if improved vehicle suspensions can reduce overall system cost by allowing lower guideway maintenance standards. Cost determinations are limited to guideway annual maintenance and vehicle suspension installation and maintenance. The guideway/suspension system is divided into several areas which are analyzed separately. In Part I, transfer function models of passenger railcar and bus dynamics, and power spectral density models of guideway disturbances are developed. Preliminary guideway and suspension cost data are also analyzed.

See also Part 2, PB-265 967.

Klinger, DL Cooperrider, NK Hedrick, JK White, RC Calzado, A  
Arizona State University, Tempe, Department of Transportation Final Rpt. DOT/TST-76/95-1, July 1976, 159 pp

Contract DOT-OS-50107

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265966/2ST, DOTL NTIS

02 156210

**DYNAMICS OF VEHICLES ON ROADS AND ON RAILWAY TRACKS, PROCEEDINGS OF IUTAM (INTERNATIONAL UNION OF THEORETICAL AND APPLIED MECHANICS) SYMPOSIUM, 1975**

Included are 32 papers on the dynamic behavior, stability, and control of road and rail vehicles. Particular attention is paid to problems where the contact or guiding forces acting between vehicle and road or guiding systems are of primary importance. Topics discussed include the simulation of multibody vehicular systems, plane motions of automobiles, the evaluation of vehicle lateral dynamics, dynamic behavior of tractor/semitrailer systems, the stability of single track vehicles, vibrations and stability of bogie-mounted railway vehicles, with particular attention paid to undesirable oscillatory motion called "hunting", active control of rail vehicle lateral dynamic performance, cushion-type noncontacting suspensions for tracked levitated vehicles, including suspensions using either air pressure or magnetic fields to transmit forces between vehicles and their guideways, the dynamics and optimal control of magnetically levitated vehicles on flexible guideways, and the interaction between an aircraft and a nonrigid runway. Also presented are 6 state-of-the-art papers on road and rail vehicle dynamics.

Proceedings of IUTAM Symposium at Delft University of Technology, Netherlands, August 18-22, 1975.

Pacejka, HB (Delft University of Technology, Netherlands) *International Union of Theor & Appl Mech, Proc* Proceeding 1976, 581 pp

ACKNOWLEDGMENT: EI (EIX770400430)  
ORDER FROM: Swets & Zeitlinger BV, Heereweg 347B, Lisse NL-1660, Netherlands

02 156223

**OSCILLATION BEHAVIOR OF RAILROAD ROLLING STOCK IN THE PRESENCE OF RIGHT AND LEFT WHEEL [Das Schwingungsverhalten von Schienenfahrzeugen bei Unterschiedlicher Rechter und Linker Raderregung]**

Due to inevitable irregularities of the track, the vehicles which are rolling on it will be stimulated to perturbed motions. These are of an irregular nature just as the interferences originating from the track. Hence an approximative realistic description of the oscillations occurring during operation is difficult if use is made of classical dynamics. The computation can be implemented

only by the methods of systems theory for irregular processes. Formulas are presented for the computation of the characteristics of oscillation of railroad vehicles under right and left wheel excitation. Possible methods for measurement of the input signal which is necessary for the computation of the statistical characteristic functions are described. [German]

Krettek, O (Technical University of Aachen, West Germany) *Elektrische Bahnen* Vol. 47 No. 3, Mar. 1976, pp 68-74, 8 Ref.

ACKNOWLEDGMENT: EI (EIX770400130)  
ORDER FROM: ESL

DOTL JC

02 156246

**THE RELATION BETWEEN LONGITUDINAL GUIDANCE OF THE WHEELSET IN THE BOGIE FRAME AND IMPEDING ROTATION BETWEEN THE BOGIE AND VEHICLE BODY [Zusammenhang zwischen der Radsatzfuehrung in Laengsrichtung im Drehgestellrahmen und der Drehhemmung zwischen Drehgestell und Fahrzeugkasten]**

No Abstract. [German]

Sperling, E *Leichtbau der Verkehrsfahrzeuge* Vol. 29 No. 4/5, July 1976, pp 93-94, 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

02 156877

**A NEW METHOD OF DETERMINING THE VERTICAL FORCE EFFECTS BETWEEN WHEEL AND RAIL**

The DB has adopted a newly developed technique based on the wheel-centre method to determine the vertical force component Q on locomotive wheels. With stress analysis by means of strain gauges, points are found at which the stress depends on the measured quality Q. The Q method has already proved successful during various high-speed train runs, but there is no doubt that it is capable of improvement and further development. [German]

Kneifel, A Dorfler, E *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 97-99

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

DOTL JC

02 156878

**A RE-EXAMINATION OF THE PRONENESS TO DERAILMENT OF A RAILWAY WHEEL-SET**

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 Nadal's classical formula. It shows it to be highly relevant for practical decision-making.

Gilchrist, AO Brickle, BV *Journal of Mechanical Engineering Science* Vol. 18 No. 3, 1976, pp 131-141, 7 Fig., 30 Ref.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

02 157577

**COMMENTS ON RAILWAY DYNAMICS [Generalidades sobre dinamica ferroviaria]**

The author gives information on the mathematical models used for the scientific study of riding comfort and stability problems. He begins with a few general considerations and then examines the vertical dynamics of rail vehicles to obtain the transfer function of vertical suspensions. Vehicle transversal dynamics are also examined on a straight line and on curves. The

author analyses bogie transverse stability as a decisive element in determining maximum vehicle speed using the Kalker theory on wheel-rail interaction to express bogie movement in the form of equations. [Spanish]

Roland Joly, M  
Asociacion de Investigacion del Transporte No. 13, Dec. 1976, pp 59-75,  
15 Fig., 4 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Asociacion de Investigacion del Transporte, Madrid, Spain

02 157533

**EXPERIMENTAL RESEARCH ON RUNNING GEAR WITH INDEPENDENTLY MOUNTED RADIAL WHEELS FOR RAILWAY VEHICLES** [Experimentelle untersuchungen und Laufwerken mit lenkbar gekoppelten Einzelraedern fuer Schienenfahrzeuge]

It would be an advantage to use independently mounted radial wheels for the running gear of railway vehicles for short-distance traffic but no suitable designs are being constructed at present. The authors mention tests carried out on a model running gear, to determine running stability characteristics and the effects of the values of certain decisive parameters. [German]

Hejj, E Tomalla, G *Krupp Tech Mitteilungen, Forschungs ber u Werksber*  
No. 3, 1976, pp 141-152, 18 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Krupp (Friedrich) GmbH, Postfach 10, 43 Essen, West Germany

02 157534

**METHOD OF STUDY OF THE PROPAGATION OF FORCES IN VERY LONG AND MULTIPLE UNIT TRAINS** [Metod issledovanija processov rasprostraneniya vozmuscenij v sverhdlinnyh i soedinennyh poezdah]

The article presents a method of theoretical study by means of electronic calculations, on the propagation of longitudinal forces in very long freight trains or those hauled by multiple units, when the characteristics of couplings between wagons are non-linear. A second locomotive placed in the middle of this type of train considerably reduces the longitudinal dynamic forces when the brakes of the two locomotives are applied simultaneously, and makes it possible to reach normal braking conditions twice as quickly. [Russian]

Grebenjuk, PT *Vestnik Vniizt* Vol. 36 No. 1, 1977, pp 1-4, 4 Fig., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

02 157544

**A STUDY OF COMFORT AND TRACK FORCES FOR A TWO AXLE RAILWAY VEHICLE RUNNING ON TRACK WITH STOCHASTIC LATERAL ALIGNMENT ERRORS** [Undersokning av komfort och sparkrafter foer en 2-axlig jaernvaegsvagn vid stokastiskt lateralt sparfel]

A condensed survey of the report. The aim of the analysis was to find means of studying the effects of track alignment errors on wheel-track forces and on the passengers. A root-mean-square (rms) value was computed instead of deriving a complete time-history for every potentially interesting dynamic quantity, thus giving results in a very compact form. [Swedish]

Knall, G  
Swedish State Railways 1976, 183 pp

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Swedish State Railways, Development Department, Stockholm, Sweden

02 157562

**CALCULATION OF QUASISTATIC LATERAL FORCES ACTING BETWEEN WHEEL AND RAIL ON CURVED TRACK** [Beregning av kvasistatiske sidekrefter som opptrer mellom kjul og skinne i kurver]

A nonlinear, quasistatic method for calculation forces acting between wheel and rail on curved track is developed by NSB. The method, which is based on the use of a digital computer, is developed for vehicles with two-and

three-axle trucks with cross-connection. The following parameters can be nonlinear: effective conicity, angle of contact between wheel and rail, friction as a function of creepage between wheel and rail, and lateral stiffness of cross-connection between trucks. The method was checked against representative experiments and the results were found to be satisfying. [Norwegian]

Haugen, FG *NSB-Teknikk* Vol. 2 No. 4, 1976, pp 82-86, 8 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Norwegian State Railways, Storgaten 33, Oslo, Norway

02 157695

**FACILITY FOR ACCELERATED SERVICE TESTING. THE FIRST EXPERIMENT**

The Facility for Accelerated Service Testing (FAST) is a track loop located at the DOT Transportation Test Center at Pueblo, Colorado. A train operating around the loop for up to 16 hours per day exposes track and equipment components under test to loads approximately ten times as rapidly as in revenue service. Plans for FAST and its construction and operation were achieved in less than one year because of the enthusiastic support provided by all interested parties, particularly the Federal Railroad Administration, the railroads, the railroad supply industry, the Railway Progress Institute, the Association of American Railroads and the Transportation Development Agency of Canada.

Association of American Railroads Technical Center est Rpt. 7 R-250,  
2nd Edition T, Oct. 1961, 32 pp, Figs.

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

DOTL RP

02 157696

**USER'S DOCUMENTATION, DETAILED VERTICAL TRAIN STABILITY MODEL**

The longitudinal dynamic forces during train "run-in" conditions can be large. They can cause car body pitching and vertical bounce motions. When such motions become severe, they can result in vertical coupler disengagement and/or car body separation from the trucks. Such undesirable vertical motions increase equipment failures, damage the lading and may cause derailments resulting in loss of revenue and human life. The Detailed Vertical Train Stability Model and the computer program were developed to study the dynamic forces and motions of a train consist in the vertical plane parallel to the rails. It offers an analytical tool for investigating train handling and train make-up procedures to evaluate possible dangerous conditions like center plate or coupler separation. The present documentation is for the Version I of the program.

Raidt, JB Shum, KL Martin, GC Garg, VK  
Association of American Railroads Technical Center R-256, Feb. 1977,  
66 pp

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

DOTL RP

02 157697

**TECHNICAL DOCUMENTATION, DETAILED VERTICAL TRAIN STABILITY MODEL**

This report represents the technical manual documentation for the Detailed Vertical Train Stability Model. The longitudinal dynamic forces during train "run-in" conditions can be large. They can cause car body pitching and vertical bounce motions. When such motions become severe, they can result in vertical coupler disengagement and/or car body separation from the trucks. Such undesirable vertical motions increase equipment failures, damage the lading and may cause derailments resulting in loss of revenue and human life. The Detailed Vertical Train Stability Model and the computer program were developed to study the dynamic forces and motions of a train consist in the vertical plane parallel to the rails. It offers an analytical tool for investigating train handling and train makeup procedures to evaluate possible dangerous conditions like center plate or coupler separation. The present documentation is for the Version I of the program.

Raidt, JB Shum, KL Martin, GC Garg, VK

Association of American Railroads Technical Center R-261, Feb. 1977, 45 pp, 22 Fig.

ACKNOWLEDGMENT: AAR

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

DOTL RP

02 157709

**VERTICAL EFFECTS OF VEHICLES ON THE BED**

Owing to increasing speeds and axle forces of the railway vehicles and the growing volume of traffic the bed is increasingly loaded and needs restoration. Conventional methods are rather expensive and cannot always be realized, as it illustrated by the Prague-Bratislava line. New methods of bed restoration are therefore suggested, whose evaluation needs a more exact knowledge of forces in the bed under load. Stresses are analysed, the mathematical model of the effect of a force moving in the elastic-isotropic half-space is considered, and is compared with results of laboratory measurements. [German]

Jirsak, Z *DET Eisenbahntechnik* Vol. 25 No. 4, Apr. 1977, pp 166-169

ACKNOWLEDGMENT: British Railways

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

02 157710

**FACTORS INFLUENCING THE FRICTIONAL AND WEAR BEHAVIOUR OF THE WHEEL/RAIL SYSTEM**

The proposed ultrarapid rail traffic calls for new wheel and rail materials. Mention is made of laboratory tests on the friction and wear characteristics of new material combinations. A comparison with data obtained in actual service proves that the tests are useful. This is followed by a discussion of the more recent findings on the behaviour of material combinations in respect of strength and structure when subjected to rolling friction.

Krause, H Scholten, J *Glaser's Annalen ZEV* Vol. 101 No. 4, Apr. 1977, pp 103-109

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

02 157711

**THE "TORMENTED" FREE WHEELSET**

The ignorance or non-observance of the fundamental considerations relating to the action of the freely guided wheelset, as dealt with by Baseler and Heumann, resulted in the development of a number of unsuccessful running gears, some of which are mentioned here in the hope the future workers in this field pay greater attention to the requirements of curve negotiation. [German]

Koffmann, JL *Glaser's Annalen ZEV* Vol. 101 No. N4, Apr. 1977, pp 121-124

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

02 157921

**RAIL VEHICLE SKIDDING PROBABILITIES AND EVALUATION PROBLEMS [Die Schleuderwahrscheinlichkeit von Schienenfahrzeugen und die Probleme bei der Berechnung]**

This article describes a method of evaluating vehicle slip probabilities using characteristic statistical data on the friction coefficient and data on axle loads and guiding forces. [German]

The article is continued in n12 (Dec. 1976), pp 292-295.

Krettek, O *Elektrische Bahnen* Vol. 47 No. 11, Nov. 1976, pp 266-270, 5 Fig., 16 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

02 157932

**NATURAL AND LOAD-INDUCED STRESSES ON A WHEEL TIRE [Last-und Eigenspannungen eines Radreifens]**

The authors show the effects of natural and load-induced stresses on the strains in the material in the wheel/rail contact area resulting from abnormal tire wear such as cracks, scaling, or crushing of the material. The results are based on recent tests on natural stresses in the rail/wheel contact surface and make it possible to determine new criteria for the choice of wheel steels. [German]

Krause, H Christ, E *Eisenbahntechnische Rundschau* Vol. 25 No. 12, Dec. 1976, pp 748-752, 8 Fig., 1 Phot., 29 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

02 157935

**INITIAL CONDITIONS FOR SIMULATIONS CALCULATIONS IN HIGH-SPEED FRICTION TESTS [Zur Frage der Einlaufbedingungen bei Reibversuchen fuer Hochgeschwindigkeitssimulationsrechnungen]**

Computer techniques and appropriate simulation calculations make it possible to determine the combinations of construction parameters necessary for fixing the limits of running stability. However, in order to obtain suitable data for construction, calculations must include a good representation of stresses on wheel/rail contact surfaces, as well as a representation of the oscillations. An ideal situation cannot be had at the outset, but the values required should be determined at a test plant. [German]

Krettek, O *Archiv fuer Eisenbahntechnik* Vol. 31 Dec. 1976, pp 64-76, 13 Fig., 2 Tab., 25 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

02 157936

**CONSIDERATIONS ON THE PROBLEM OF NON-STATIONARY AIR CURRENTS OCCURRING WHEN TRAINS PASS THROUGH TUNNELS [Ueberlegungen zum Problem der instationaeren Stroemung bei einer Zugfahrt durch einen Tunnel]**

When non-stationary aerodynamic phenomena occur, acceleration and deceleration forces are produced which influence the environment. The author explains the main reasons for these non-stationary phenomena and supports these with results from tests carried out in a number of tunnels. [German]

Glueck, H *Archiv fuer Eisenbahntechnik* Vol. 31 Dec. 1976, pp 77-81, 7 Fig., 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

02 157938

**THE PRACTICAL APPLICATION OF THE KINEMATIC GAUGE AT THE DB IN ACCORDANCE WITH UIC LEAFLET 505**

[Praktische Anwendung der kinematischen Begrenzungslinien nach den UIC-Merkblaettern]

No Abstract. [German]

Stuchly, H *Archiv fuer Eisenbahntechnik* Vol. 31 Dec. 1976, pp 32-34, 2 Fig., 1 Tab., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

02 158192

**QUASI-STATIC LATERAL TRAIN STABILITY MODEL**

The Quasi-Static Lateral Train Stability Model simulates a train on a given track in a pushing or braking mode. The program calculates lateral forces at the bolster centers and coupler pins, a quasi-static equilibrium position, the coupler angles and the moments due to alignment control. Derailment, wheel climbing, rail overturning, train makeup, draft gear wear, track



configuration and curve negotiation forces may be calculated. As a design tool, the program can be used to evaluate the effect of carbody overhang, maximum bolster lateral displacement from the centerline of the track, optimum bolster spacing and coupler length.

Thomas, LR MacMillan, RD Martin, GC  
Association of American Railroads Tech. Rpt. R-209, No Date, 65 pp 41 F, ig., 1 App.

ACKNOWLEDGMENT: AAR  
ORDER FROM: AAR

DOTL RP

## 02 158213 DIRECT RECORDING OF WHEEL-RAIL PARAMETERS

There are no published results of direct measurement of the geometric parameters which control the lateral movement of a worn wheel on a worn rail. Displacement of a worn wheel over a worn rail itself provides a method measuring such parameters. In this manner the real values of effective conicity and gravitational stiffness can be evaluated. In order to give lateral displacement, an apparatus has been designed suitable for measurements to be taken at the railside. At each lateral movement the wheels are lifted from the track. Tests of the apparatus, using temporary instrumentation, are discussed. A newly designed measurement system is described based on the results of the preliminary testing. A description of the apparatus and instrumentation is given. With the aid of this equipment, the geometric parameters can be measured. Experiments are now necessary to evaluate the system in service and to acquire results.

Blader, FB (National Research Council of Canada)  
Canadian Institute of Guided Ground Transport Final Rpt.  
CIGGT-75-13, Oct. 1975, 15 pp, 9 Fig.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

## 02 159665

### FACILITY FOR ACCELERATED SERVICE TESTING (FAST). PROGRESS REPORT NO. 1

This report describes preliminary observations of test results at the Facility for Accelerated Service Testing (FAST) which is a 4.8 mile loop located at the Transportation Test Center in Pueblo, Colorado. The loop is divided into 22 different test track sections which permits evaluation of various types of track components and construction. The track is subjected to one million gross tons of traffic per day as a 9,500 ton train traverses the loop, running approximately 500 miles. Thirteen (13) mechanical equipment components of various designs are under evaluation in the tests. This report outlines qualitative test results for the first 6 months of testing, during which time 60 million gross tons of traffic and 31,500 miles were accumulated. This period of time represents a small fraction of the service life of most components under test and in most instances test data is insufficient for a rigorous analysis. Significantly more traffic will be necessary before valid conclusions may be drawn from the experiments.

See also RRIS 02 148271 7701 and 02 157695 7702.

Lundgren, JR Guins, SG Punwani, SK Role, H  
Association of American Railroads Technical Center Intrm Rpt. R-264,  
Apr. 1977, 53 pp

Contract DOT-FR-64248

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 043618

**CONTRIBUTION TO JUDGING THE RIDING COMFORT OF RAILWAY WAGONS**

Increase in the riding comfort of passenger railway carriages, an improvement in air conditioning and illumination, and reduction in noise and vibration are discussed. Tests in railway car construction have two aims: (1) to determine riding comfort as observed by the passengers, and (2) to advise the constructors on improvements. The subjective estimation of riding noise and vibration is considered. (Author)

Translated into English from *Glaser's Ann.* (West Berlin), October 1956, pages 314-317.

Sperling, E

Royal Aircraft Establishment RAE-LIB-TRANS-1630, BR-29692, July 1972, 14 pp.

ACKNOWLEDGMENT: NTIS (N72-3265)

ORDER FROM: NTIS

N72-3265, DOTL NTIS

03 052628

**STRENGTH OF BODIES OF PASSENGER COACHES. DESCRIPTION OF THE METHOD USING THE GENERAL THEORY OF REDUNDANT FRAMES AND THE METHOD OF "FINITE ELEMENTS" FOR THE CALCULATION OF PASSENGER COACH BODIES-EXAMINATION OF RESOURCES AND RESULTS**

This report recalls the method using the general theory of redundant frames (see ORE-Report B 7/RP 7) and also presents in detail the "finite element" method for the complete calculation of the bodies of passenger coaches (stresses, deflections and natural frequency). The characteristics inherent in each method are examined and a comparison made between the calculated values and the experimentally measured values in the case of the standard CFF domestic service coach. The costs and the fields of application of the two methods are specified in particular. The possibilities offered by the three-dimensional finite element analysis for calculating any structure of railway stock (asymmetrical coach body, tank wagon, bogie frame, solid wheel, rail, bridge structure etc.) are also indicated. A few indications are also provided to show how, in the case of a conventional coach, it is possible to deduce the natural frequency of the fitted body from the value calculated for the shell. Finally, the appendices to the report provide all necessary instructions for using the calculation programme of the two methods and the practical application procedures.

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

International Union of Railways B7/RP 8/E, Oct. 1973, 27 pp, Figs., Tabs., 4 Ref., Apps.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 052859

**VIENNA ARSENAL VEHICLE TESTING STATION. REPORT ON THE ACTIVITIES OF THE VIENNA ARSENAL VEHICLE TESTING STATION IN THE YEAR 1973/74**

This report briefly describes the tests and other activities of the Vehicle Test Center of Vienna Arsenal during the period when it was "closed" and during the reconstruction of the dynamic test chamber; it describes also the first few months of use of the new installation. The report sums up the test program adopted for high speeds. Graphs of performance of the two climatic test chambers are included. [French]

Restrictions on the use of this document are contained in the explanatory material. Abstract only available in English.

International Union of Railways AZ 30/RP 15/E, Apr. 1975, 28 pp, 7 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: UIC

DOTL RP

03 052924

**USE OF LIQUID-GAS COOLING FOR REFRIGERATOR VANS. COMPARATIVE TESTS ON REFRIGERATOR VANS EQUIPPED WITH VARIOUS COOLING SYSTEMS**

In order to compare the performance of a liquid-gas-cooled refrigerator van with those of other types of van, three vans were tested in the Vienna Arsenal Testing Station. These were: 1. A mechanically-cooled van; 2. A van cooled by the COORA dry-ice system; 3. A van cooled by the POLARSTREAM liquid-nitrogen system. The k-values of the vans were measured and tests were then carried out on the cooling-down of the van and on the subsequent regulation of the cooling with varying external conditions. These tests showed the POLARSTREAM system to be reliable and to have excellent controllability. A large reserve capacity enables initial cooling-down to be made in a much shorter time than required by the other two vans.

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

International Union of Railways B94/RP 2/E, Apr. 1969, 15 pp, 5 Fig.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 052925

**USE OF LIQUID GAS COOLING FOR REFRIGERATOR VANS. THE ATMOSPHERE CREATED INSIDE REFRIGERATOR VANS COOLED BY DIFFERENT MEANS**

Tests were carried out by Specialists Committee B 94 to find the atmospheric conditions which would occur inside refrigerator vans cooled by various methods involving the evaporation of liquids or solids in open systems. To find whether liquid air would be suitable for use as a refrigerating medium measurements were made of the composition of the contents of two insulated liquid air vessels which were placed, with openings to the atmosphere, in a large room under normal atmospheric conditions. It was found that as natural evaporation occurred considerable fractionation of the air took place, the last remaining contents of the vessels being almost pure oxygen. A second test was carried out using one of these vessels, fitted with a spray evaporation system similar to that provided in liquid nitrogen cooled refrigerator vans, placed in a small insulated chamber representing a refrigerator van body. The oxygen contents of the chamber was checked during the evaporation of liquid air and was found to increase beyond the safety limit for carrying perishable vegetable foodstuffs. Tests carried out to check whether similar effects could occur with industrial liquid nitrogen, which might contain a small amount of oxygen, showed that there was no risk of ultimate oxygen enrichment occurring. Measurements of the atmosphere formed inside nitrogen cooled vans are results obtained statically. Report RP 4 concerning tests carried out on the line will give further details of dynamic results with varying loads. Tests carried out on a COORA controlled dry ice cooled refrigerator van, to measure the escape of gaseous CO sub 2 in the loading space of the van, showed that CO sub 2 concentrations up to 68% inside of the body can be reached.

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

International Union of Railways B94/RP 3/E, Oct. 1969, 28 pp, 6 Fig.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 052926

**USE OF LIQUID GAS COOLING FOR REFRIGERATOR VANS. LINE TESTS AND AN ECONOMIC SURVEY OF REFRIGERATOR VANS COOLED BY VARIOUS MEANS. THE EFFECT ON PERISHABLE GOODS OF DIFFERENT ATMOSPHERES (TEXT AND APPENDICES 1-14)**

Description and results of line tests carried out between 1967 and 1969 to examine the service performance of liquid nitrogen cooled and mechanically cooled refrigerator vans. Recording of temperature variations and consumption of fuel or refrigerating medium. Examination of atmosphere in the nitrogen cooled vans and condition of the goods. A survey of the advantages and disadvantages of the different types of refrigeration system in use at the present moment, taking into account the overall suitability and reliability of the systems and the cost involved. An examination under laboratory conditions of the effect of the different atmospheres, caused by various types

of refrigeration systems, on the preservation of fruit, vegetables and meat at low temperatures.

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

International Union of Railways Final Rpt. B94/RP 4/E, Oct. 1970, 156 pp, 92 Fig., 27 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 052927

**OPTIMUM RELATIONSHIP BETWEEN WHEELBASE AND LENGTH OF TWO- AXLED GOODS WAGONS WITH AUTOMATIC DRAW-AND-BUFFING COUPLINGS. RUNNING TESTS ON DB TRACK**

The present Interim Report includes results obtained from running trials with 2-axled goods wagons whose wheel-bases, spring suspension, and transverse play were adjustable. The purpose of the tests was to assess the running properties of vehicles whose running gear dimensions failed to conform with the Specification in UIC Leaflets 571-1 and 571-3, and had a greater a/1 ratio. Vehicles of this type would react more favourably to high, longitudinal compressive forces when equipped with automatic couplings. Vehicles with rectangular shackles did not give a clear picture in previous tests. Two of the vehicle types (SNCF and DB) were shown to have considerably poorer running properties when tested at speeds above 85 km/hr when using the longest wheel-base as the most favourable for this arrangement. In the maximum speed range, these vehicles were defined as "unacceptably poor". The other two types continued running satisfactorily even at high speeds. In the case of the OBB wagon, this seems due to the very long wheel-base of 10.15 m, which is not practicable for other reasons. In the case of the SNCF wagons, the reason for the good behaviour has not yet been found; further investigations are necessary. Vehicles equipped with double-shackle running gear proved that satisfactory running properties were possible even with great a/1 ratios of up to about 0.8 at speeds up to 130 km/hr. This means that wagons with a longer wheel-base and shorter overhang than the previous wagons corresponding to UIC Leaflet 571-1 and 571-3, can be operated without ill-effects on their running properties. However, these results should be confirmed by tests on SNCF track, which will be discussed in a later interim report.

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

International Union of Railways Intrm Rpt. B93/RP 1/E, Mar. 1967, 17 pp, 22 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 052928

**OPTIMUM RELATIONSHIP BETWEEN WHEELBASE AND LENGTH OF TWO- AXLED GOODS WAGONS EQUIPPED WITH AUTOMATIC TRACTION AND SHOCK COUPLER. RUNNING TESTS ON SNCF AND DB TRACK**

This report (RP 2) concerns additional running tests with two-axled goods wagons of the DB, SNCF and OBB, of which the wheel-base and the running gear were varied, the other dimensions being kept constant.

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

International Union of Railways B93/RP 2/E, Oct. 1968, 35 pp.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

03 052929

**OPTIMUM RELATIONSHIP BETWEEN WHEELBASE AND LENGTH OF TWO- AXLED GOODS WAGONS EQUIPPED WITH AUTOMATIC TRACTION AND SHOCK COUPLER. TESTS WITH MODIFIED DOUBLE SHACKLE LONG SUSPENSIONS AND SUMMARY OF THE RESULTS**

Running quality tests to  $V = 130$  km/h on two-axled goods wagons with variable wheelbases have shown that: (1) contrary to the views hitherto, the

double shackle long suspension can be used, with the largest wheelbases possible from the constructional point of view, without any deterioration of the riding properties; (2) the single shackle short suspension in the form tested with reduced lateral play between axle box and axle guards, but retaining plate axle guards, is slightly better than the double shackle long suspension at the maximum wheelbases as far as the riding properties are concerned; (3) good riding properties can be achieved using wheel profiles with strong centering effect in the transverse direction at gauge widths not exceeding 1440 mm; (4) an increase of the centering effect of the double shackle long suspension in the transverse direction (by a 50% reduction of the effective pendulum length), while maintaining the original centering effect in the longitudinal direction, only entails a slight deterioration of the riding properties (this deterioration may possibly be compensated by an increased friction in the suspension system); and (5) an increase of the axle loads to 20 t in S and SS traffic would not seem to meet with any objections as far as the lateral forces exerted on the track are concerned. While choosing the type of spring suspension for wagons to be fitted with the automatic traction-and- shock couplings, allowance should be made for the fact that the single shackle short suspension does not allow radial adjustment of the wheelset on small radius curves, and, consequently, greater guiding forces and higher flange and rail wear must be expected. Moreover, greater guiding forces give rise to increased risk of derailments on twisted tracks.

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

International Union of Railways Final Rpt. B93/RP 3/E, Oct. 1969, 11 pp, 1 Fig.

ACKNOWLEDGMENT: UIC  
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03 053201

**VIENNA ARSENAL VEHICLE TESTING STATION. REPORT ON THE ACTIVITIES OF VIENNA ARSENAL VEHICLE TESTING STATION IN THE YEAR 1975**

The present report describes briefly the tests and other activities of the International Vehicle Testing Station, Vienna Arsenal, during the year 1975. Coaches, locomotives and wagons from nine countries were tested for their own railway, for ORE Committees or for private manufacturers. Appended are details of the two modernized climatic chambers and the newly installed brake test rig.

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

International Union of Railways AZ30/RP 16/E, Apr. 1976, 22 pp, 7 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL RP

03 053203

**STANDARDISATION OF WAGONS. COVERED BOGIE WAGON, TYPE GABSS**

This report describes the design of the standard covered bogie wagon, series Gabbs, and contains the results of tests carried out in accordance with ORE Report B 12/RP 17.

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

International Union of Railways B12/RP 24/E, Apr. 1976, 29 pp, 10 Fig., 15 Tab.

ACKNOWLEDGMENT: UIC  
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03 053206

**CALCULATION OF EQUIVALENT CONICITIES FOR THE S 1002 WHEEL PROFILE ON UIC 60 RAILS**

At the request of the Director of ORE the BR calculation method has been used to determine the equivalent conicities for the S 1002 wheel profile on UIC 60 rails at various inclinations and track gauge. The results show that use of the standard wheel profile on rails laid at 1:20 may give rise to inadequate guidance. Inclinations of 1:30 and 1:40 give satisfactory conicities if track gauge is not less than 1,435 mm.

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



material.

Hobbs, AEW (British Railways Board)

International Union of Railways DT54/E, Oct. 1975, 4 pp, 6 Fig., 4 Ref.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 053213

**ELASTIC SYSTEM FOR TRACTION AND SHOCK GEAR (SIDE BUFFERS AND CENTER BUFFERS). SUPPLEMENTARY TESTS WITH LOAD-PROTECTING DEVICES**

As suggested in the conclusions of report B 36/RP 10, buffing tests were carried out with wagons fitted with the automatic coupler and with the "Daberkow" system and also running tests with wagons with the screw coupling and side buffers and with "movable rigid partitions" and "Daberkow" systems. From the comparison of the results of the buffing tests with wagons equipped with the "Daberkow" system, it has been found that, as a result of the superposition of the displacement process produced by the coupling of wagons fitted with the automatic coupler, the stressing of load and wagon is greater than in the case of wagons equipped with the screw coupling. Running tests with wagons fitted with "movable rigid partitions" and "Daberkow" systems have shown that longitudinal and transverse displacements of the transported goods cannot be entirely avoided. The available information is completed by the evaluation of the results of previous tests (B 36/RP 10).

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

International Union of Railways B36/RP 15/E, Apr. 1976, 42 pp, 26 Fig., 2 Tab.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 053214

**ELASTIC BUFFERS FOR TRACTION AND SHOCK GEAR (SIDE BUFFERS AND CENTRE BUFFERS). LEAFLET OF SPECIFICATION FOR LONG-STROKE SHOCK ABSORBING SYSTEMS**

Tests with long-stroke shock absorbing systems made by the ORE B 36 Committee (B36/RP 11) and those made with container wagons by the ORE B 112 Committee enabled the specification for long-stroke shock absorbing systems to be produced.

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

International Union of Railways B36/RP 18/E, Oct. 1976, 15 pp, 1 Fig.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 053219

**MODERN SUSPENSION SYSTEM FOR TWO-AXLED WAGONS. PROGRESSIVE SUSPENSION FOR EXISTING TWO-AXLED WAGONS**

The report describes a proposal for standardisation of a progressive axle suspension in the form of a parabolic spring with a length of 1400 mm. The results of comprehensive line and beach tests with different types of progressive axle suspensions are also given.

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

International Union of Railways B134/RP 1/E, Apr. 1976, 37 pp, 63 Fig., 16 Tab.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 053220

**ELASTIC SYSTEMS FOR TRACTION AND SHOCK GEAR (SIDE BUFFERS AND CENTRE BUFFERS). ACCEPTANCE TESTS FOR THE ELASTIC SYSTEM OF THE "RING SPRING" TYPE B412A FOR THE AUTOMATIC COUPLER**

The report deals with the acceptance tests with the elastic system ring spring type B 412 A. 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 A.

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

International Union of Railways B36/RP 17/E, Oct. 1976, 28 pp, 22 Fig., 8 Tab.

ACKNOWLEDGMENT: UIC

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03 053221

**TESTS WITH AUTOMATIC COUPLERS. UIC AUTOMATIC COUPLER- BASIC VERSION 1969E**

This report briefly outlines the development and the chief features of the UIC basic version 1969e of the automatic coupler. It specifies the requirements it has to meet and also the differences between the first UIC and OSJD versions. It describes the manner of manufacture, the compatibility of the UIC type with the OSJD type and with the SA3 coupler and covers questions concerning the interchangeability of the UIC and OSJD couplers. The more important specifications are mentioned as are also the main regulations which covered the development and manufacture of the UIC basic version 1969e.

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

International Union of Railways B51/RP 19/E, Oct. 1976, 80 pp, 21 Fig.

ACKNOWLEDGMENT: UIC

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03 093771

**LOCAL DERAILMENT SENSOR AND BRAKE ACTUATOR SYSTEM**

The patent application describes a motion sensor combined with a journal bearing thermal detector which produces an output signal utilized to activate a train's brake system upon detection of a local wheel derailment or excessive bearing temperatures. Wheel impact with the roadbed and/or bearing temperatures exceeding a predetermined value causes the sensor to activate a percussion-initiated power source. The output signal triggers an electroexplosive brake venting mechanism, puncturing and venting the brake line for a full service brake application to stop the train.

Government-owned invention available for licensing. Copy of application available NTIS.

Armstrong, JH Wassman, WW

Department of the Navy Patent PAT-APPL-495-480, No Date, 19 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

AD-D001261/7ST, DOTL NTIS

03 094671

**INVESTIGATIONS OF A BEARING FAULT DETECTOR FOR RAILROAD BEARINGS**

The laboratory tests are described which were conducted on new and damaged bearings to determine the feasibility of using high-frequency vibration as a diagnostic tool. A high-frequency band pass filter and demodulator was assembled to permit field measurements of the high-frequency vibrations. Field tests were conducted on an actual truck and on an axle assembly run in a grease test rig. These field tests were directed toward demonstration of the suitability and capabilities of the high-frequency technique for field application. Two specific areas of field application were identified as being cost effective for railroad use. One area is the examination of railroad roller bearings at a derailment site, and the second is as a wayside detector to supplement present hot box detectors for defective roller bearings. (Author)

Wilson, DS Frarey, JL  
Shaker Research Corporation NASA-CR-144114, 1975, 46 pp

Contract NAS8-31449

ACKNOWLEDGMENT: NTIS  
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N76-14467/4ST, DOTL NTIS

**03 148578**  
**NECESSITY OF NEW MODEL SUBURBAN DIESEL PASSENGER TRAINS**

The design of self-propelled cars for suburban services connecting with the Shinkansen service at Hakata is described. These high-capacity coaches are welded steel with air-spring trucks, diesel-torque converter drive and air conditioning. Some of the features, including fire retardant interiors, are also described.

Hotta, K (Japanese National Railways) *Japanese Railway Engineering*  
Vol. 16 No. 1, 1975, pp 17-18, 1 Tab.

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**03 148603**  
**A COACH BOGIE OF INTERNATIONAL COLLABORATION FOR VERY HIGH SPEEDS-THE Y.32-FIAT. PART 2**

In this part the authors deal with principal calculations and trials.

See also Part 1, RRIS 03 130674, Bulletin 7602.

Moron, P Santanera, O *Rail Engineering International* Vol. 6 Sept. 1976,  
5 pp, 7 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL JC

**03 148614**  
**THE CASE FOR STRENGTHENING THE FLEXURAL RIGIDITY OF THE BODIES OF HIGH-SPEED VEHICLES [O povysenii izgibnoj zestkosti kuzovov vysokoskorostnyh passazirskih vagnov]**  
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 148617**  
**APPLICATION OF THE "DUO" TYPE BOGIE TO TRAILING STOCK**

The origin of French locomotives and cars, the development of ideas of design, factors entering into the concept, and the coupling together of trucks are discussed.

Caire, D *French Railway Techniques* No. 2, 1976, pp 99-105

ACKNOWLEDGMENT: EI  
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**03 148814**  
**RESULTS OF TESTS IN SERVICE OF 8-AXLE HIGH-SIDED OPEN CARS [Rezultaty ekspluatatsionnyh ispytaniy 8-osnyh poluvagonov]**

Based on the results of tests in service carried out on 8- axle high-sided open cars constructed in different years, this article analyses the causes of failure of the various components or structural parts of the car, resulting in withdrawal for routine overhaul. [Russian]

Borodaj, SM Pasarin, SI *Vestnik Vniit* Vol. 35 No. 6, 1976, pp 35-37,  
2 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Transport Publishing House, Basmannyi Tupik, 6a, Moscow  
B-174, USSR

**03 148824**  
**ACOUSTIC ASPECTS OF RAILWAY VEHICLE DESIGN**  
No Abstract.

Eade, PW Stanworth, CG *Institution of Mechanical Engineers Proceedings*  
Vol. 190 No. 58, 1976, pp 515-525, 10 Phot.

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

DOTL JC

**03 148825**  
**REMARKS ON THE KINEMATIC VALUE OF JOLTING**  
[Bemerkungen zur kinematischen Grosse "Ruck"]

From the vectorial character, the author deduces the speed, the acceleration and jolting, for the movement of a point along a curve in a plane. The jolting is the third derivative of the movement. He then briefly discusses the practical application, and stresses that jolting becomes more specially important as the rate of acceleration changes wherever people are subjected to such conditions, as when in a vehicle. [German]

Preysing, EJ *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 23  
No. 1, 1976, pp 133-143, 13 Fig., 1 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
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**03 149402**  
**REEFER REFRIGERATION SYSTEMS FOR MEAT TRANSPORTATION**

A new unit concept introduced recently has a squared-off rectangular evaporator that protrudes into the cargo area only 12.6 in. with an insulated wall, a radial blower wheel, air exchanger valve, and improved thermostat.

Paper prepared for the ASAE Annual Meeting, Nebraska University,  
Lincoln, June 27-30, 1976.

Kunkle, H (Thermo King Corporation) *ASAE Transactions Conf Paper*  
Pap 76-6004, June 1976, 11 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: American Society of Agricultural Engineers, 2950 Niles  
Road, P.O. Box 410, St Joseph, Michigan, 49085

**03 149403**  
**SPECIFICATIONS AND TESTING OF REEFER TRAILERS AND CONTAINERS FOR TRANSPORTING MEAT**

The state of the art of refrigerated trailers and container construction and testing is discussed along with current organizational influence and governmental regulation. Data on thermal performance and on the development of thermal testing procedures are offered in addition to future design trends.

Paper prepared for the ASAE Annual Meeting, Nebraska University,  
Lincoln, June 27-30, 1976.

Yglesias, JR (Great Dane Trailers, Incorporated) *ASAE Transactions Conf Paper*  
Pap 76-6003, June 1976, 48 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: American Society of Agricultural Engineers, 2950 Niles  
Road, P.O. Box 410, St Joseph, Michigan, 49085

**03 149406**  
**ELECTRIC EQUIPMENT OF MULTIPLE UNITS SERIES 472/473**  
[Elektrische Ausrustung fuer die Triebzeuge der Baureihe 472/473]

A description is given of the electric equipment of the multiple units consisting of three parts with all axles driven which has been developed for the urban rapid transit system of Hamburg, West Germany. The arrangement of main circuits and the driving and braking control are explained. The three-phase auxiliary supply network fed by a rotating converter, the door-control and heating and lighting of the passenger areas are also described. [German]

Wegener, P *Elektrische Bahnen* Vol. 47 No. 1, Jan. 1976, pp 24-27, 2 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

03 149407

**SIX-AXLE HIGH-SPEED URBAN RAPID TRANSIT CAR CONSTRUCTION TYPE KOELN (COLOGNE) [Der Sechssachsige Schnellverkehr-Stadtbahnwagen Bauart Koeln]**

A light-weight rapid-transit car is described which will make possible a gradual transition from the conventional operation toward a modern rapid transit system. The two-unit articulated multiple unit in steel light weight construction meets strict standards with regard to performance and riding quality. It reaches a maximum speed of 100 km/hr with a starting acceleration of 1.1 m/sq sec, has a one-hour rating of 2 x 235 kw at 750 v dc power supply and offers a capacity of 72 seats and 111 standers. The mechanical part and the electric equipment are described. [German]

Lellmann, K Barsch, O *Elektrische Bahnen* Vol. 47 No. 2, Feb. 1976, pp 31-38, 3 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

03 149440

**PROTOTYPES OF A NEW PASSENGER COACH FOR SHORT-DISTANCE TRAFFIC [Prototypen eines neuen Reisezugwagens fuer den Nah-und Bezirksverkehr]**

The DB's new concept for short-distance coaching stock involved designing more up-to-date and attractive new coaches, to encourage the general public to use the railway and at the same time relieve traffic on town approach roads. The new coach must be designed not only for fast urban traffic, but also for fast regional trains. In addition, the new coaches will be used in long-distance traffic if required. The writer describes this new coach. [German]

Felsing, A *Eisenbahntechnische Rundschau* Vol. 25 No. 10, Oct. 1976, pp 595-606, 4 Fig., 4 Phot., 2 Ref.

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

DOTL JC

03 149453

**PASSENGERS WILL SAMPLE TILTING TRAIN THIS SPRING**

With sharp curves and severe grades, Spanish National Railways main lines form an ideal proving ground for the tilting-body train. A four-car experimental set completed last year has made extensive test runs and is to get commercial trains at 180 km/h. Tilting will allow average speed on principal routes to be raised by as much as 40 per cent.

Gonzales, JLS (Spanish National Railways) *Railway Gazette International* Vol. 133 No. 2, Feb. 1977, 3 pp, 1 Fig., 3 Phot.

ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

DOTL JC

03 149454

**EXPERIMENTAL TALGO FEATURES PENDULAR BODY-TILTING**

An experimental tilting-body train, a new version of the Talgo, has been tested by Spanish National Railways at speeds to 200 km/h. Talgo cars tilt under combined effect of gravity and centrifugal force. Tilting is suppressed at speeds below 70 km/h and on curves of more than 1,500 m radius.

Lumpie, DJC (Spanish National Railways) *Railway Gazette International* Vol. 133 No. 2, Feb. 1977, pp 58-59, 1 Fig., 1 Phot.

ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

DOTL JC

03 149455

**THREE BOGIES TO CARRY APT**

The running gear for the three revenue-service prototype Advanced Passenger Trains for British Rail differs somewhat from the original design. The truck design and arrangement to achieve maximum carbody cross-section within the restricted BR clearances are described. The current design does not have articulated cars but does feature two-axle trucks with long wheelbase. Arrangements to maximize passenger comfort are discussed.

*Railway Gazette International* Vol. 133 No. N2, Feb. 1977, 2 pp, 3 Fig.  
ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

DOTL JC

03 149949

**COOPERATION BETWEEN SCIENCE AND PRACTICE FOR THE CONSTRUCTION OF RAILWAY VEHICLES [Wissenschaft und Praxis bei der Gestaltung von Schienenfahrzeugen]**

After presenting the collaboration existing between DB and research institutes of technical universities for the construction of new vehicles and of vehicle devices for high speed lines, the author explains the experience gained on the Bielefeld-Hamm high speed test line as regards aerodynamics on the line and in the tunnel, vehicle resistance tests, braking conditions, tests on bogies, axles and wheelset bearings. [German]

Buddensiek, H *Eisenbahntechnische Praxis* Vol. 28 No. 3, 1976, pp 2-7, 16 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hauptvorstand Gewerkschaft der Eisenbahner Deutsch, Beethovenstrasse 12/16, Frankfurt am Main 2, West Germany

03 149951

**MATHEMATICAL MODELS FOR STUDYING TRANSVERSAL VIBRATION IN THE FRAMEWORK-SUPPORTED SIDES OF CAR BODIES [Matematiceskie modeli dlja issledovanija poperecnyh sterznevnyh elementov kuzova vagona]**

The vibrations envisaged are natural and induced vibrations in these wagon sides. The dynamic stresses in various body sections are determined. The article shows that the theoretical and experimental results as regards these vibrations do match fairly precisely. [Russian]

Husidov, VD Krasnikov, VK *Vestnik Vniizt* Vol. 35 No. 7, 1976, pp 33-36, 4 Fig., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

03 149952

**CHOICE OF A TRUCK SPRING SUSPENSION SYSTEM FOR HIGH-SPEED FREIGHT CARS [K vyboru sistemy resornogo podvesivaniya telezek gruzovyh vagonov dlja vysokih skorostej dvizenija]**

Description of a method for the theoretical study of these systems, involving speeds of up to 140 km/h. The frequency-amplitude characteristics are analysed as well as the spectral density of vibration in wagons equipped with different suspension systems. The method proposed in this article recommends, for the construction of freight wagons intended for speeds ranging from 140 to 150 km/h, that use be made of a twin spring suspension with greatest possible static deflection (consistent with the conditions for automatic-coupler connection), and that this equipment should for the most part be housed above the axle-box. In this way, the bogie will be subjected to lesser acceleration. [Russian]

L'vov, AA *Vestnik Vniizt* Vol. 35 No. 7, 1976, pp 29-33, 8 Fig., 3 Tab., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

03 149972

**THE STRESSES OF A LOCOMOTIVE TRUCK FRAME AND OF THEIR FREQUENCY DISTRIBUTION [Naprijazennost' ram lokomotivnyh telezek i ee ekspluatacionnoe rassejanie]**

This article describes the results of resistance tests carried out on locomotive truck frames, and the fundamental laws on frame stresses. It also gives an assessment of stress dispersal during locomotive running, and the dispersal effect of the stresses on the value of the safety coefficients of the structures. [Russian]

Mejsner, BA *Vestnik Vniizt* Vol. 35 No. 7, 1976, pp 21-26, 5 Fig., 3 Tab., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

**03 149975**

**THE ISO CONTAINER AND TYPES DERIVED FROM IT [Le conteneur ISO et ses derives]**

The article goes over the stages in the standardization of ISO containers (International Organization for Standardization), the characteristics and the different types derived from the conventional container, designs for the conveyance of the most varied commodities (ventilated container, refrigerated container, container with removable roof). [French]

*MTD-Manutention/Transport/Distribution* Nov. 1976, pp 93-96, 1 Fig., 1 Tab., 6 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Compagnie Francaise d'Editions, 40 rue du Colisee, 75 Paris 8e, France

**03 149981**

**RESEARCH ON PROBLEMS OF BENDING VIBRATION IN COACHES [Untersuchungen zum Biegeschwingungsproblem bei Reisezugwagen]**

The writer describes a vibration model for the study of the influence of given parameters in the bogie on vertical bending vibration behaviour, when conditions are made worse by the wheelsets being out of balance and running out of true. Non-linear factors due to damper friction have been taken into consideration. [German]

Hill, A. *DET Eisenbahntechnik* Vol. 42 No. 11, Nov. 1976, pp 492-495, 7 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

**03 150405**

**THE ADVANCED PASSENGER TRAIN**

The history and development of British Railways' Advanced Passenger Train (APT) are discussed. The technical objectives are considered in the context of their value to commercial and operating performance. Among the technical aspects discussed are dynamics of guidance and suspension, aerodynamics, power and transmission, braking, and lightweight body structures. Highlights of the research and development programme are described, with reference to laboratory and track testing of the experimental train (APT-E) and associated experimental vehicles. The paper concludes with a description of the design of the prototype electric train (APT-P), of which three are currently being constructed for operation on the London/Glasgow route.

Boocock, D Newman, M *Institution of Mechanical Engineers Proceedings* Vol. 190 No. 62, 1976, pp 653-663

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**03 150414**

**PIGGYBACK AND THE PORTAGER DREAM-1. ALMOST 20 YEARS AGO A CANADIAN LOCOMOTIVE BUILDER TRIED TO EMPTY BUSY TRUCK THOROUGHFARES AND FILL UP EMPTY TRACKS BY INVENTING A STRANGE LITTLE 4-WHEEL FREIGHT CAR. THIS IS WHAT HAPPENED...**

In 1958 General Motors Diesel and Canadian Pacific cooperated in the design and testing of a lightweight, two-axle piggyback car onto which containers would be side loaded. This container car accommodated 40-foot boxes weighing up to 30 tons, was to operate in conventional trains, provide a ride at least equal to a highway ride, run at 75 mph, require no special trailers, transmit no shock damage to container or lading, and sell at a low price.

Howard, FH *Trains* Vol. 37 No. 6, Apr. 1977, pp 44-51, 1 Fig., 16 Phot.

ORDER FROM: Kalmbach Books, 1027 North Seventh Street, Milwaukee, Wisconsin, 53233

DOTL JC

**03 150682**

**THE BALLISTIC AND MECHANICAL PROPERTIES OF POLYMERS**

Transparent armor for applications such as vision blocks, wind screens, and face shields rely on polymers either completely or as a part of a ceramic-plastic composite. Transparent polymeric armor systems are not currently as efficient on a weight basis as opaque armor systems. This work was undertaken to find ways to increase the efficiency of polymeric armor systems. It would be highly desirable to be able to correlate ballistic behavior with the material and physical properties of the polymeric system to enable rapid predictions of ballistic resistance as well as to lead to improved transparent armor. Up to the present time no such correlation has been known. It was one of the purposes of this study to determine what properties, if any, would consistently be indicative of the ballistic strength of the polymer. (Author)

Distribution limitation now removed.

Martin, DM Lewis, RW Thomas, GR  
Army Natick Laboratories 1968, 13 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-837134/2ST, DOTL NTIS

**03 151161**

**ULTRASONIC DETECTION OF PLATE CRACKS IN RAILWAY WHEELS**

The results of experimental efforts established the feasibility of the detection of railway wheel plate cracks by an ultrasonic pulse echo testing technique from the tread surface. Feasibility and test sensitivities were established using artificial notches in a flat plate test reference and in full-size wheels. Concepts for manual inspection of stationary wheels and the automatic testing of moving wheels are described.

Sponsored by the FRA/U.S. DOT, through the Transportation Systems Center, U.S. DOT.

Becker, FL  
Battelle Memorial Institute/Pacific Northwest Labs, Federal Railroad Administration, Transportation Systems Center Final Rpt. FRA/ORD-76-277, July 1976, 88 pp

Contract DOT-TSC-726

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262644/8ST, DOTL NTIS

**03 151221**

**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 in-track device for moving cars. Determinations of the natural modes of vibrating wheels 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 sounds 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.

Prepared by Houston University, Texas, Department of Mechanical Engineering.

Nagy, K Finch, RD  
Transportation Systems Center, Houston University, Federal Railroad Administration Final Rpt. DOT-TSC-FRA-76-6, FRA/ORD-76/290, Oct. 1976, 206 pp

Contract DOT-FRA-76-6

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263248/7ST, DOTL NTIS



03 152408

**CONSTRUCTION POSSIBILITIES USING SPECIAL STEEL SECTIONS FOR VEHICLES [Konstruktive Moeglichkeiten durch die Anwendung von Spezialprofilen aus Stahl im Fahrzeugbau]**

The author describes the processes for production of special sections and their dimensions. He then uses examples to show how hot and cold steel sections can be used for producing hauled stock, containers, lorries and trailers. He also quotes approximate cost for the tools needed to make a section. [German]

Steinhoff, H *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 3, May 1976, pp 52-57, 11 Fig., 3 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

03 152411

**METHOD OF CALCULATING THE CAPACITY OF LOCOMOTIVE MAINTENANCE WORKSHOPS DURING TRANSFORMATION FOR ROUND-THE-CLOCK OPERATION [Metodika rasceta moscnosti lokomotivoremontnyh zavodov pri perehode na potocnoe proizvodstvo]**

Description of a method of calculating the capacity (annual repair programme) of locomotive maintenance workshops. Recommendations are given for operating this type of workshop during transformation for chain-work. [Russian]

Gizatulin, EZ *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 32-34, 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

03 152413

**INCREASE OF THE AXIAL EFFORT ADMISSIBLE FOR CYLINDRICAL ROLLER BEARINGS [Provyshenie osevoj gruzopod'ennosti cilindricheskikh rolkovykh podpisnikov]**

Using the results of the examination of bearings in service, and of bench tests on roller bearings with different-shape contact areas, the article determines the optimum profiles for the latter. [Russian]

Cjurenko, VN *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 38-41, 5 Fig., 3 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

03 152415

**METHOD OF ASSESSING THE RELIABILITY OF CAST FREIGHT WAGON PARTS [Metod ocenki ekspluatacionnoj nadeznostilyh delatej gruzovyh vagonov]**

The article suggests a method for calculating the characteristics of the reliability of cast freight wagon parts according to data about failures in service. [Russian]

Kostenko, NA *Vestnik Vniizt* Vol. 35 No. 4, 1976, pp 42-45, 1 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

03 152421

**MAINTAINABILITY ANALYSIS OF DIESEL-ELECTRIC LOCOMOTIVES**

This paper deals with the effectiveness of preventive maintenance of diesel electric locomotives. The effectiveness can be considered in several different contexts. It can be considered qualitatively, as a reduction in the frequency and severity of locomotive component failures, or as a statistically significant change in the probability of failure-free operation over a given number of locomotive-miles (i.e. reliability). As the implementation of various preventive maintenance techniques and procedures ultimately requires an additional expenditure of capital, the benefits incurred by an improvement in reliability, such as a decrease in maintenance expenditures required to achieve a given level of operational reliability, or a decrease in required locomotive-fleet inventories proportional to lower accumulated fleet down

time, must ultimately be quantified as a monetary benefit, and weighed against the associated cost penalty. Each of these approaches is explored in this analysis. The methodology is applied to cost-effectiveness of testing of diesel-electric locomotives for predictive and preventive maintenance of electrical subsystems using SEARCH (System Evaluation and Reliability Checker). It is shown that the application of SEARCH could result in cost-savings as well as improved performance of locomotives.

Rawat, SK

Institute of Electrical and Electronics Engineers Res. Rpt. No Date, 9 pp, 8 Tab., 1 Ref.

ACKNOWLEDGMENT: IEEE

ORDER FROM: Canadian Transport Commission, Railway Transport Committee, 275 Slater Street, Ottawa, Ontario K1A 0N9, Canada

DOTL RP

03 152425

**A NEW LOOK AT SUBCRITICAL QUENCHING (SCT) FOR FATIGUE STRENGTH IMPROVEMENT**

A comprehensive summary of in-house information concerned with thermal prestressing of large forgings for fatigue strength improvement is presented. Seven commercial grades of carbon and alloy steel railway forgings with and without a subcritical quenching treatment (SCT) are compared. Conventional designs of full-size press-fitted assemblies and a filleted shaft were tested in rotating bending to evaluate the treatment. Fatigue strength improvement values ranging from 45 to over 130 percent have been established for breaking off in the wheel fit, depending upon the yield strength of the shaft material and the configuration at the press fit. Compressive residual stresses induced by the treatment were measured for most materials, and in some instances the loss of surface compression due to cyclic stressing was evaluated. An example of practical use of the information summarized is cited by a discussion of the application of SCT in the development of a tubular axle for transit car service. Information being presented in this paper updates published literature with current technology pertinent to the application of thermal prestressing to a variety of large forging materials. It provides a comprehensive reference background to substantiate and stimulate greater use of the treatment by others confronted with the design of fatigue resistant assemblies.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Neifert, HR (The Timken Company)

American Society of Mechanical Engineers Conf Paper Paper 77-RT-4, Mar. 1977, 8 pp, 13 Fig., 5 Tab., 7 Ref.

ACKNOWLEDGMENT: ASME

ORDER FROM: ESL

DOTL RP

03 152428

**APPLICATION OF SIMULATION COST MODELLING TO RAILROAD ROLLER BEARING USAGE**

This paper describes a dynamic simulation technique for determining costs associated with the use of a component by an economic system. The cost simulation technique is presented with respect to the annual operating cost (i.e., acquisition and maintenance cost) of railroad freight car roller bearings. The three basic pieces of the technique-- schematic diagram, computer program, and data--are discussed for this roller bearing case. A first version of the technique is described: consequently, the paper does not attempt to present the most realistic representation of roller bearing usage or to give the most accurate roller bearing data. Rather the paper illustrates the use and potential of the technique and the information which it can produce. This information includes component-associated costs and system behavior, cost sensitivities, cost benefits, and time-trend predictions.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977. The cost analysis model described in the paper was developed under sponsorship of DOT, through the Transportation Systems Center.

Krauter, AI Waldron, WD (Shaker Research Corporation)

American Society of Mechanical Engineers Conf Paper Paper 77-RT-7, Mar. 1977, 9 pp, 3 Fig., 4 Tab., 5 Ref.

Contract DOT-TSC-917(4)



ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

03 152434

**A COMPARISON OF THE STRESS LEVELS IN ONE-AND TWO-WEAR 36-IN. DIAMETER WHEELS UNDER SIMULATED SERVICE LOADS**

An investigation of the stress level produced in 36-in. wheels during normal service operation, including the effects of wear, is presented in this publication. In particular, the stress fields were determined for both one- and two-wear wheels of different geometric design and manufacture. Stress fields were generated for each one-wear wheel design in both the new and worn configurations. However, stress fields were determined for the new, returned, and worn tread profiles for the two-wear wheels. From the analysis, it was concluded that decreasing the rim thickness of 36-in. (0.914-m) wheels increases the state of stress in locations critical to the formation of shattered rims, plate cracks, and back-rim cracks. The increase in level of stress is at a low rate and low level during the first wear period of a two-wear wheel. A more rapid rate of increase of stress to levels of the same approximate magnitude for the second wear period of two-wear wheels and the life of one-wear wheels is observed. Based on the above, it is suggested that one-wear wheels would spend more of their service life in a state of high stress than would two-wear wheels.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

Novak, GE (Del Engineering, Incorporated); Stone, DH (Association of American Railroads Technical Center)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-13, Mar. 1977, 12 pp, 14 Fig., 9 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

03 152451

**CHECKING THAT THE EXPERIMENT ON THE ARRIVAL OF DAMAGED WAGONS IN REPAIR SHOPS COMPLIES WITH THE SIMPLEST STATIONARY STOCHASTIC FLOW MODEL [Proverka sootvetstviya eksperimental' nogo potoka otkazov vagonov modeli prostejsego potoka otkazov]**

No Abstract. [Russian]

Portnov, JuF *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 25-29, 1 Fig., 2 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

03 152465

**WASHINGTON METRO'S RAPID TRANSIT CARS**

Every new transit property faces a multitude of difficult decisions in establishing the design criteria for its transit cars. These decisions deal with the cars' construction, dimensions, the various sub-systems, their interface with each other and with the train control equipment to provide optimum performance economically without sacrificing the equipment reliability and maintainability. This paper gives a description of the Washington Metro's present rapid transit cars and will give a brief evaluation of these cars' demonstrated performance.

Presented at the 1977 Joint ASME/IEEE/AAR Railroad Conference, March 30-April 1, in Washington, D.C.

Bassily, FP (Washington Metropolitan Area Transit Authority)  
Institute of Electrical and Electronics Engineers Tech. Pap. 77CH1237-71A, 1977, pp 32-41, 22 Fig., 3 Ref.

ACKNOWLEDGMENT: IEEE  
ORDER FROM: ESL

DOTL RP

03 152618

**LOAD AND INTERNAL STRESSES IN A WHEEL TIRE**

This article on the problem of unusual wheel tread wear, including cracking, pitting and material deformation, shows the relationship between material,

wheel load, friction and contact surface. By means of formulae, some of which were derived from exhaustive tests, it should thus be possible by using suitable parameters to determine the optimal material for the particular wheel tyre. [German]

Krause, H Christ, E *Eisenbahntechnische Rundschau* Vol. 25 No. 12, Dec. 1976, pp 748-752

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

DOTL JC

03 152627

**RESULTS GAINED FROM EXPERIENCE WITH LONGER DISTANCES BETWEEN OVERHAUL OF ELECTRIC LOCOMOTIVES [Cto pokazal opyt uvelicheniya mezremontnyh probegov elektrovozov]**

The article describes the results of tests done on this subject and concludes that because of variations in the workload of electric locomotives depending on the lines they operate on, standards regarding the distances such locomotives should cover between overhauls should be varied according to the coefficient of use of tractive power. Furthermore, this article puts forward a series of measures to improve the useful life of certain locomotive parts and gear.

Vinogradov, JuN *Zheleznodorozhnyi Transport*

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

03 152638

**ON THE FUTURE DESIGN OF DRIVER'S CABS IN RAILWAY VEHICLES. AN EXAMPLE OF A PRACTICAL ERGONOMIC SOLUTION TO THE PROBLEM [Zur kuenftigen Gestaltung der Fuehrerraume von Schienenfahrzeugen. Beispiel einer praktischen ergonomischen Aufgabenloesung]**

No Abstract. [German]

Strecker, H *Zbl. Arbeitsmedizin* Vol. 26 No. 8, Aug. 1976, pp 146-154, 8 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Zbl. Arbeitsmedizin, Heidelberg, West Germany

03 152642

**ANALYSIS OF STATISTICS ON DAMAGE TO ROLLER BEARINGS IN AXLE BOXES [Analyse de statistiques d'avaries de roulements de boites d'essieux]**

A method for foreseeing damage to bearings due to normal wear and tear is compared with an analysis of statistics on axle-box roller bearings. In most cases the figures for real and calculated wear are very similar. Statistics also show figures that are often high for wear that could be avoided. By improving axle-box design and using better lubricating grease this type of damage could be stopped. [French]

Bergling, G *Revue des Roulements* No. 189, 1976, pp 1-5, 1 Tab., 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Svenska Kullagerfabriken, Aktiebolaget, Goeteborg S-415 50, Sweden

03 152659

**PIGGYBACK AND THE PORTAGER DREAM--2. IN A SEA OF CLEJANS, TTX'S, NITX'S, FLEXIS, AND RAILVANS...PORTAGER DROWNED**

The interest of railroads in side loading of trailers and containers found General Motors Diesel's Portager car an early candidate. Canadian Pacific continued its early advocacy of the single-trailer/container rail vehicle with regular revenue operation of ten of the two-axle Portagers. While the concept was licensed in the U.S. and two prototypes were extensively tested, the long flat car capable of transporting two trailers/containers was generally accepted. The final stages of the GMD development program, the end of the firm's interest in the project and the simultaneous evolution of competitive systems are discussed.

See also Piggyback and the Portager Dream--1, RRIS 03 150414 7702.

Howard, FH *Trains* Vol. 37, No. 7, May 1977, pp 44-51, 17 Phot.  
ORDER FROM: Kalmbach Publishing Company, 1027 North Seventh Street,  
Milwaukee, Wisconsin, 53233

DOTL JC

03 152672

**SANTA FE TRIES "ARTICULATED SKELETON" FOR TOFC/COFC LOADS**

A lightweight unit train of skeleton-car sections has been developed by Santa Fe for handling trailers and containers. The 51.5-foot segments, consisting of center sills semipermanently joined by articulated connections, are carried by a conventional truck under each articulation. The road is seeking a vehicle which offers low first cost, reduces locomotive fuel consumption, will reduce both loss and damage in either trailers or containers, and has the ability to accommodate 45-foot trailers.

Welty, G *Railway Age* Vol. 178 No. 6, Mar. 1977, pp 36-37, 2 Fig.

ORDER FROM: ESL

DOTL JC

03 152673

**DELIVERY HAS BEGUN OF EUROPE'S FIRST STANDARD COACH**

Delivery of the first of 500 Eurofima standardized passenger cars ordered by six railways in western Europe has started. Although it was not possible to set up a single production line, standardization of the structural design and use of standard subassemblies (trucks, air conditioning, power supply, doors, windows, interior fittings and seating) has substantially reduced costs over custom-designed cars. International Union of Railways gave initial impetus to development of a vehicle which could be used in international trains.

Dewald, E (Eurofima) *Railway Gazette International* Vol. 133 No. 4, Apr. 1977, 4 pp, 3 Fig., 2 Tab., 5 Phot.

ORDER FROM: ESL

DOTL JC

03 152800

**1500 V, DC ELECTRIC RAILCARS FOR LINE "A" OF THE ROME METROPOLITAN RAILWAY [Elettromotrici a 1500 V c.c. per la linea "A" della Metropolitana di Roma]**

A brief introduction gives characteristics of the line "A" design layout, the results achieved and principal characteristics of the railcar are given followed by a description of the railcar itself with regard to both its mechanical and electrical parts. [Italian]

Ciuliani, D (STEFER, Rome, Italy) *Ingegneria Ferroviaria* Vol. 123 No. 3, Mar. 1976, pp 5-15

ACKNOWLEDGMENT: EI (EIX770200080)

ORDER FROM: ESL

DOTL JC

03 153052

**SELECTING AN URBAN LIGHT RAIL VEHICLE FOR EFFICIENT OPERATION AND UTILIZATION**

Selection of the best design for a Light Rail Transit system is a complex process. The designer is faced with an array of right-of-way options, station designs, fare collection schemes, and alternative vehicle designs. Vehicle selection is determined principally by passenger requirements, operations design, fare collection arrangements and station designs with cost, service and operating efficiency as the main measures of performance. This paper discusses the design of light rail transit vehicles including the technology, cost and efficiency.

Proceedings of RTAC Annual Conference, Calgary, Alberta, 1975.

Clark, GA (Urban Transportation Development Corporation)  
Roads and Transportation Association of Canada Proceeding No. 7, Sept. 1975, pp 137-159, 5 Ref.

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 153055

**THE CASE FOR THE "BATHTUB" CAR**

For the past six years CP Rail has been using a specially- designed bathtub gondola for hauling coal shipments. The economics resulting from the lower tare weight of this type of car is discussed with reference to reduced fuel costs, reduced track maintenance, and increased pay loads.

Tenney, HB (Western Reserve Association) *Progressive Railroading* Vol. 20 No. 3, Mar. 1977, pp 54-56, 1 Tab., 3 Phot.

ACKNOWLEDGMENT: CNR

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

DOTL JC

03 153064

**A NEW GENERATION OF CENTRE-AISLE ROLLING-STOCK: THE CORAIL COACHES**

French National Railways ordered 1,300 Corail coaches for day travel, particularly for those using Second Class. Corail is an acronym combining Comfort and Rail. New design techniques and emphasis on aesthetics are stressed. The cars are to be air conditioned and many will have features for at-seat meal service. Introduction of these cars will eliminate the last pre-war equipment from express trains on the SNCF network.

Translated from *La Vie du Rail*, No. 1527, January 25, 1976.

Cassy, M *French Railway Techniques* No. 4, 1976, pp 185-199, 15 Fig., Tabs.

ORDER FROM: ESL

DOTL JC

03 153065

**MAIN LINE PASSENGER ROLLING-STOCK DEVELOPMENTS SINCE 1965 AND FUTURE PROSPECTS**

The evolution of French passenger cars between 1965 and 1975 is described. Extensive detail is given on design criteria, carbody, interior arrangements, power supply, air conditioning, trucks, brake equipment and telecommunications. The constraints on car design and observations about future requirements are also included.

Jousserandot, P (French National Railways) *French Railway Techniques* No. 4, 1976, pp 165-182, 17 Fig., 3 Tab.

ORDER FROM: ESL

DOTL JC

03 153080

**A NEW TRUCK FOR HIGH-SPEED COACHES: FROM THE Y28 TYPE TO THE Y32 TYPE**

The author gives the historical background of the new Y32 truck which is intended for main line rolling stock suitable for 200 km/h operation. The author explains the design and gives a very full description of the parts of the pneumatic suspension of this truck which has disc brakes combined with shoe brakes, a solution giving the best adhesion. Tests of this truck gave excellent results up to 250 km/h. [French]

Moron, P *Revue Generale des Chemins de Fer* Sept. 1974, pp 497-508

ACKNOWLEDGMENT: FRA

ORDER FROM: ESL

DOTL JC

03 153081

**TRUCK-FRAME TEST-RIG AT THE DB'S EXPERIMENTAL AND TEST STATION IN MINDEN**

The article discusses the need for testing large railway components in accordance with the actual conditions encountered in service and describes the German Federal Railway's testing at the Minden Experimental Station. This includes damping foundation, mounting plate, clamping frame with four hydro-pulse cylinders with associated electrical control and regulating equipment, also a multi-purpose press. Reference is also made to the versatility and scope for development of the test-rig. [German]

Lange, H Müssnig, V Schenk, H *Eisenbahntechnische Rundschau* Jan. 1974, pp 50-55, 6 Ref.



ACKNOWLEDGMENT: FRA

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

DOTL JC

03 153083

**APPLYING DESIGN PRINCIPLES TO HIGH SPEED ROLLING STOCK [L'étude "Design" du matériel TGV]**

Research, begun at the end of 1968, on the TGV 001 experimental train was directed to the external form so as to obtain the best possible aerodynamic coefficient. It also concerned the choice of a characteristic outside decoration scheme and the interior fittings and arrangement. The future trainsets will be electric, so it was therefore necessary to incorporate the current collection system, the ventilation installations and other things in the silhouette. As regards inside layout the fittings, experience had shown that the design of some parts of the TGV 001 (seats, luggage racks) was unsatisfactory, and this has been modified. The atmosphere created by colour, lighting and the various parts of the coach has been the subject of special research so as to provide rather intimate surroundings even though the coaches are of the open type. [French]

Cooper, J *Revue Generale des Chemins de Fer* Dec. 1976, pp 797-801, 9 Fig.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

03 153084

**MAINTENANCE POLICY FOR HIGH SPEED ROLLING STOCK AND THE METHODS EMPLOYED [La politique d'entretien des rames a grand vitesse et ses moyens]**

Although the rolling stock has yet to be built, it is already essential to make a provisional inventory of maintenance work and take the necessary measures so that the staff responsible will have everything they require by October 1981. The aim of the study has therefore been to extrapolate the results already known for 200 km/h operation and take account of the specific features of the operation of the new line. Maintenance shops are planned at Bischheim, an inspection depot at Villeneuve-Saint-Georges, and checking sheds at the present Paris South-East depot. Some special problems have been studied such as the reprofiling of wheels. An inventory of work to be done has thus been made during 1975 with the various tasks involved divided among the three depots. Provision must therefore be made for changes in the workload of the three depots from their present situation to their future situation when 80 trainsets will have been delivered by July 1982. [French]

Metzler, JM (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 802-806, 4 Fig.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

03 153088

**BOGIES AND TRANSMISSIONS FOR HIGH SPEED RUNNING [Bogies et transmissions pour grandes vitesses]**

The bogie to be fitted to the Paris South-East trainsets is derived directly from the Y 226 type bogie which incorporates some of the constructional solutions used in the bogies for the most recent passenger rolling stock (Y 207, Y 28, Y 233, Y 32) particularly well adapted for high speed performance, comfort, stability and ease of maintenance. However, the secondary suspension will have "flexicoil" springs with a main suspension appreciably the same as that of the Y 226 bogie which has been under test for a long time on the Z 7001 trainset which is capable of attaining 300 km/h. The anti-hunting devices will be positioned longitudinally and achieved by a system of rods, whilst the power transmission will comprise a hollow double cardan shaft, concentric at the axle (Jacquemin transmission). [French]

Dupont, R Daffos, J (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 781-785, 4 Fig.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

03 153089

**STRUCTURES OF BODIES AND FITTINGS [Structures des caisses et aménagements]**

The main problems concerning the bodies for the high speed trains were: the design of the articulation of these bodies, the actual construction of the bodies, streamlining, comfort provided passengers and consequently the design of interior fittings and amenities. The authors explain the solutions adopted in these different areas for the bodywork of the end car, intermediate cars and the power car. With special reference to the accommodation provided for passengers, inquiries and opinion polls were carried out and a full scale mock-up placed on public display. [French]

Tachet, P Boutonnet, JC (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 773-780, 12 Fig.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

03 153092

**GENERAL DESIGN OF THE HIGH SPEED TRAINSETS [L'architecture generale des rames TGV]**

The Paris South-East high speed trainsets differ appreciably from conventional rolling stock. They must be capable of running at 260 km/h for considerable distances, suitable for taking 1,500 V direct current, 25 kV Hz current, and even 15 kV 16 2/3 Hz current in certain cases, and provide accommodation in both classes at a cost price per seat approximately the same as in conventional trains. The author states that the solutions adopted are the result of long research and experiments carried out with the full scale TGV 001 unit and Z 7001 trainset. These high speed trains will be of the electric articulated type with the ends of adjacent coaches resting on the same bogie. There will be ten vehicles with the BoBo power cars at each end of the eight trailer cars. Each 200-metre long trainset will have 284 seats, 276 being in 2nd class (4 abreast) and 108 in 1st class (3 abreast) and a bar. The total weight of the trainset will be 380 tonnes giving an axleload of 16.3 tonnes. For aesthetic reasons and because of resistance to forward motion, the electrical equipment has been studied most meticulously in a wind tunnel, and the electrical connection will be provided through a 25 kV cable laid directly on the roof. The author then describes the progress of the studies, the construction and final adjustment work by the bodies in which the SNCF departments involved and the manufacturers were all represented. [French]

Garde, R (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 761-766, 4 Fig., 1 Tab., 1 Ref.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

03 153093

**THE TIME FOR MAJOR DECISIONS: THE MAIN INNOVATIONS FOUND IN PARIS SOUTH-EAST ROLLING STOCK [L'heure des grandes options: les innovations essentielles apportées par le matériel Paris-Sud-Est]**

Some twenty years of research and development have enabled the design to be decided definitely for the new Paris South-East line rolling stock. Dual-current trainsets comprising 10 coaches with 13 bogies, 6 of which are motor bogies, an axle-load of between 14 and 17 tonnes, and 6,000 kW power on both the 1,500 V direct current and the 25 kV 50 Hz alternating current systems. The author explains how it has been possible to decide on the general structure of the rolling stock that has been ordered recently. He also states why the SNCF has abandoned the idea of using gas turbine traction units. He concludes that a far-sighted viewpoint and adequate resources are required to achieve technical progress. It is also necessary to be backed up by an efficient and powerful railway industry such as exists in France. [French]

Bouley, J (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 751-754, 1 Fig.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC



03 153358

**HARMONIC ROLL SERIES, VOLUME 4: TORSIONAL AND FLEXURAL CAR STIFFNESS CHARACTERISTICS**

This phase of the Track Train Dynamics Program determined experimentally the torsional and flexural rigidity of three box cars, one covered hopper car and one flat car. Shorter cars displayed a larger value of torsional rigidity than the longer ones. The piggyback flat car was the least rigid. The unibody construction of the covered hopper proved to be the stiffest of cars tested. Recommendations are made about instrumentation for future cars to be tested.

This report represents contributions by ACF Industries/Amcar Division (Part 1) and Pullman Incorporated/Pullman-Standard Division (Part 2) to this phase of the AAR-RPI-FRA-TDA Track Train Dynamics Program.

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Research and Development Center R-184, No Date, 56 pp, 14 Fig., 11 Tab.

ACKNOWLEDGMENT: AAR

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

DOTL RP

03 153792

**THE NEW SNCF VU 75 COMPARTMENT TYPE COACHES [Les nouvelles voitures a compartiments VU 75 de la SNCF]**

The construction of the VU 75 coaches meets the desire of the SNCF to place in service a fleet of compartment type coaches with a level of comfort much higher than that of previous rolling stock. The characteristics of these coaches make them very similar to the European standard ones ordered by six European Railways including the SNCF. Orders have or are being placed for 750 coaches of which 350 are couchette coaches. They are being built by a consortium of manufacturers, namely Les Ateliers du Nord de la France and Les Etablissements De Dietrich. The VU 75 coaches are 26.4 m. long but relatively light and the layout and decoration schemes are very modern. They are fitted with Y 32 type bogies which ensures good running qualities; they are designed for speeds up to 160 km/hr. With the exception of the general-purpose coaches, all the VU 75s are air conditioned and fitted with a static converter. The latter transforms power taken from the train cable to supply a 380 V-50 Hz three-phase system and a low-voltage d.c. system. As regards the coaches for international services, the static converter operates on four types of current: 15,000 V a.c.-16 2/3 Hz, 25,000 V a.c.-50 Hz, 1,500 V d.c. and 3,000 V d.c. [French]

Bernard, JP Pujol-Soulet, L Willaime, J (French National Railways) *Revue Generale des Chemins de Fer* Feb. 1977, pp 83-96, 9 Fig., 4 Tab.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

03 153984

**ADVANCED FINITE ELEMENT TECHNOLOGY FOR STRESS ANALYSIS**

Recent advances in finite element approximation theory make it possible to develop highly user-oriented, very efficient computer programs for stress analysis. The theoretical basis for such a computer program, the results of preliminary computational tests and an outline for implementation are presented in this report.

Prepared in cooperation with ACF Industries, Inc., St. Charles, Mo. AMCAR Div., and Pullman, Inc., Chicago, Ill. Pullman-Standard Div.

Szabo, BA Peano, AG Katz, IN Rossow, MP  
Washington University, St Louis, ACF Industries, Incorporated,  
Pullman, Incorporated, Department of Transportation Final Rpt.  
DOT-TST-76/71, Feb. 1976, 139 pp

Contract DOT-OS-30108

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264894/7ST, DOTL NTIS

03 154022

**LTV/SIG METROLINER TRUCK TEST, VOLUME I**

This report presents the test plan and results for Phase 2 tests of the LTV/SIG Metroliner Truck. Section 4.0 is the test plan which was

submitted to DOT/FRA on September 5, 1974. The test plan was approved by DOT/FRA before testing began. It became necessary to amend test procedure during the test program. The changes in test procedure were approved by DOT/FRA during the course of testing, and those amended procedures are described in Section 5.0 which also presents test results. An Additional Running Test followed Phase 2 tests, and the results of Additional Tests are presented.

Also available in set of 3 reports PC E09, PB-265 133-SET.

Sandlin, NH Bumgardner, HM Dean, FE Johnston, AW  
Vought Corporation, Federal Railroad Administration Final Rpt. FRA-  
/ORD-76/251, Aug. 1975, 117 pp

Contract DOT-FR-20049

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265134/7ST, DOTL NTIS

03 154023

**LTV/SIG METROLINER TRUCK TEST, VOLUME II (SUSPENSION PARAMETER VARIATION TEST REPORT)**

An additional running test program of the LTV/SIG Metroliner trucks was conducted with the objective of defining suspension system characteristics. The tests were conducted on revenue tracks of the Penn Central Railroad in the Northeast corridor between Washington, D.C. and Hudson, N.J. Testing began on February 28, 1975 and ended on May 7, 1975. A test train comprised of snack bar coach 850 and the fleet car, snack bar coach 855, was operated for a distance of 3657 miles. Test operations were conducted on 18 days, and a total of 65 runs was made. Three hundred and sixty-eight tests were conducted within the 65 runs. Tests were conducted with 21 different suspension system configurations. The final suspension system, tuned for optimum ride quality, demonstrated that Car 850 had a ride superior to Car 855. Test data also showed that Car 850 had a lower onboard noise level than Car 855. Data obtained during the test were sufficient to generate a load spectrum for the trucks and components when operated under the current Metroliner speed profile. In addition, load-to-speed relationships were obtained for the trucks and components.

See also Volume 1, PB-265 134. Also available in set of 3 reports PC E09, PB-265 133-SET.

Dean, FE Johnston, AW Sandlin, NH  
Vought Corporation, Federal Railroad Administration Test Rpt. FRA-  
/ORD-76/252, Aug. 1975, 103 pp

Contract DOT-FR-20049

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265135/4ST, DOTL NTIS

03 154398

**RAIL TRANSIT ADVISORY BOARD, VOLUME 2. PROCEEDINGS**

Representatives of all of the major rail rapid transit properties in the U.S. participated in an advisory board to review the technical and institutional problems connected with rail cars. The report presents the results of studies of the problems and feasible solutions in these areas as they apply to the rail transit industry.

See also PB-262071.

General Motors Corporation Final Rpt. EP-76029, Sept. 1976, 123 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263072/1ST, DOTL NTIS

03 154399

**RAIL TRANSIT ADVISORY BOARD, VOLUME 1. EXECUTIVE SUMMARY OF PROCEEDINGS**

Representatives of all of the major rail rapid transit properties in the U.S. participated in an advisory board to review the problems of operation and performance requirements, interchangeability between properties and cars, reliability and maintainability, and rail car suppliers manufacturing of components. A discussion of the feasibility of solutions which might be proposed is also included. (Color illustrations reproduced in black and white.)

See also PB-262 072.

General Motors Corporation Final Rpt. EP-76031, Sept. 1976, 22 pp  
 ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS  
 PB-263071/3ST, DOTL NTIS

Carpenter, GF  
 United States Steel Corporation, Federal Railroad Administration,  
 Transportation Systems Center Final Rpt. 10-D-033(018-2),  
 FRA/ORD-77/17, Mar. 1977, 88 pp

Contract DOT-TSC-712

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-265751/8ST, DOTL NTIS

**03 154586**  
**TRANSIT VEHICLE MATERIAL SPECIFICATION USING**  
**RELEASE RATE TESTS FOR FLAMMABILITY AND SMOKE.**  
**PHASE I REPORT**

The report relates to two of the most important features in fire safety design of a transit vehicle's interior finishes and furnishings: to allow time for evacuation, and prevent a self-propagating fire. Comparative evaluation of fire performance of a fire system (as contrasted with the evaluation of the individual materials in the system) are discussed in terms of a model in which the interdependence of materials and the system are mathematically simulated to give an absolute (as compared to comparative) evaluation of a fire system and to predict what limits on loading will prevent fully developed fires in a specific situation.

Prepared in cooperation with Transit Development Corp., Inc., Washington, D.C., and American Public Transit Association, Washington, D.C.

Smith, EE  
 Ohio State University, Transit Development Corporation, Incorporated,  
 American Public Transit Association Final Rpt. IH-S-76-1, Oct. 1976, 36 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-262895/6ST, DOTL NTIS

**03 154668**  
**FORMULATING THE DESIGNS OF ELECTRICAL ROLLING**  
**STOCK USING COMPUTERS**

The article begins with a general description of computers now in use and their method of operation and instruction systems, particularly the models designated "Ural-1", "Ural-2", and "Ural-4" with passing reference to "Ural-14" and "Ural-16". The article also discusses electrical desk-top calculators with the remark that experience gained in using computers in experiments connected with calculation of rolling stock design shows that a number of problems can be solved without the use of electronic computers. Such problems as calculating traction drive, and assigning tolerances for springs with a small number of variants can usually be executed on keyboard calculators. Therefore when selecting the calculating means for solving each concrete problem it is necessary to estimate the volume of calculations required, the required accuracy of the result, and the cost of the calculating operation. The article concludes with a recommendation that most problems can be effectively handled by a semiautomatic calculating machine, such as the VMP-2. (Author)

Trans. of mono. Raschet Konstruktsii Elektropodvizhnogo Sostava na Vychislitelnykh, n.p., 1966 p5-17. Distribution limitation now removed.

Isaev, IP Perova, AA Burchak, GP  
 Air Force Foreign Technology Division FTD-MT-24-285-67, Sept. 1967,  
 22 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

AD-829194/0ST, DOTL NTIS

**03 154804**  
**THE CAUSE OF THERMAL FATIGUE CRACKING IN**  
**METROLINER WHEELS**

One new wheel and two used wheels (one with a thermal crack in the tread) were examined for mechanical properties, macrostructure, microstructure, and residual stresses. Similar examinations were conducted on three new wheels which were first subjected to various braking cycles designed to define the conditions that produce cracking. The braking tests were conducted on the laboratory dynamometer. The results of this study indicated that the wheel that had developed a thermal crack in service had been intermittently and severely heated around the tread surface and that such heating had altered the microstructure, produced residual tensile stresses and permitted the crack to initiate. The results further showed that neither altered microstructures nor cracking could be produced by many emergency brakings or speed-reduction brakings with normal brake shoes and forces.

**03 154842**  
**GUIDEWAY-VEHICLE COST REDUCTION. PART II: ACTIVE**  
**SUSPENSION FEASIBILITY**

The cost and performance benefits of using improved suspensions in passenger railcars are investigated. Preliminary results from the first year of a two year study are presented. The primary objective is to determine if improved vehicle suspensions can reduce overall system cost by allowing lower guideway maintenance standards. Cost determinations are limited to guideway annual maintenance and vehicle suspension installation and maintenance. In Part II, an assessment of active suspension feasibility is made which includes the preliminary design of a new low power pneumatic concept. A preliminary suspension/guideway maintenance cost tradeoff is described which shows that active suspensions are cost effective for low vehicle density routes.

See also Part I, PB-265 966.

Klinger, DL Cooperrider, NK Hedrick, JK White, RC Calzado,  
 A  
 Arizona State University, Tempe, Department of Transportation Final  
 Rpt. DOT/TST-76/95-2, July 1976, 82 pp

Contract DOT-OS-50107

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-265967/0ST, DOTL NTIS

**03 154855**  
**URBAN RAPID RAIL VEHICLE AND SYSTEMS PROGRAM**

The Annual Report reviews the fifth year's efforts of the Urban Mass Transportation Administration's Urban Rapid Rail Vehicle and Systems Program. Three major hardware tasks were active during this reporting period: State-of-the-Art Car (SOAC), Advanced Concept Train R&D (ACT-1), and Advanced Subsystem Development Program (ASDP). The objective of this Program is to enhance the attractiveness of rail rapid transit to the urban traveler by providing transit vehicles that are as comfortable, reliable, safe, and economical as possible. Accomplishments for the year ending September 1976 include the following: Completed arrangements to further extend the operational demonstration of the SOAC vehicles to include nine months of revenue service on the Lindenwold High Speed Line of PATCO--The design, development testing and fabrication portions of the ACT-1 program are in the final stages with delivery of the first vehicle to DOT Transportation Test Center, Pueblo, Colorado, scheduled for February 1977.

See also PB-254 727.

Boeing Vertol Company, Urban Mass Transportation Administration  
 Ann. Rpt. UMTA-IT-06-0026-77-1, Oct. 1976, 135 pp

Contract DOT-UT-10007

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-266096/7ST, DOTL NTIS

**03 155372**  
**ROSTER OF NORTH AMERICAN RAPID TRANSIT CARS**  
**1945-1976**

This document is a compilation of data on rapid transit cars built between 1945 and 1976. It includes cars in the United States, Canada and Mexico. Data include cost, performance, dimensions, weights, electrical equipment, heating and ventilating systems, traction motors, propulsion equipment, lighting systems, and trucks and suspensions. The roster is broken down by authorities in alphabetical order, and has a further breakdown per transit authority in chronological order of transit car.

American Public Transit Association, Urban Mass Transportation Administration, (UMTA-DC-06-0121) UMTA-DC-06-0121-77-1, Jan. 1977, 254 pp

Contract DOT-UT-60004

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-266620/4ST, DOTL NTIS

03 156204

#### ALUMINIUM--THE KEY TO ADVANCED RAIL DESIGN?

As long ago as the late 1920's experimental railway coaches, constructed in aluminum, were put into service and remained in use for more than 30 years. The 25 percent saving in weight conferred many advantages but the cost of aluminum at that time was a severe disadvantage. This state of affairs no longer exists as is explained in this article which describes in detail modern methods of railway-coach and freight-car manufacture.

Dean, RJ (Star Aluminium Company, England) *Sheet Metal Industries* Vol. 53 No. 11, Nov. 1976

ACKNOWLEDGMENT: EI (EIX770400531)

ORDER FROM: Engineering Society Library, 345 East 47th Street, New York, New York, 10017

03 156251

#### COLLOQUIUM ON MAINTENANCE OF ALUMINIUM RAILWAY COACHES [Colloque sur l'entretien des véhicules ferroviaires en aluminium]

Summary of a Colloquium organised at Bad Cannstatt near Stuttgart by the Aluminium working group of the "Leichtbau der Verkehrsfahrzeuge" research firm. [French/German]

Kehler, WF *Schweizer Alumin Rundschau/Revue Suisse de Alumin* Vol. 27 No. 1, Jan. 1977, pp 20-26, 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

03 156873

#### TIME TO STANDARDISE LRT CAR DESIGNS

Despite the existence of only a small number of builders of specialized cars for light rail transit systems, no standard car has emerged suitable for the two basic types of LRT operation in the way that the American PCC design of the 1930's became widely accepted on both sides of the Atlantic. The author compares, contrasts and comments on 16 basic designs in use or proposed for Western Europe and the U.S., and suggests standards covering a six-axle car suitable for straight tramway networks and an eight-axle design with greater capacity for pre-metros.

*Railway Gazette International* Vol. 133 No. 5, May 1977, pp 180-185, 2 Tab., 8 Phot.

ORDER FROM: ESL

DOTL JC

03 156879

#### TEMPERATURE MONITORING OF WHEEL-SET ROLLER BEARINGS ON THE DB ROLLING STOCK

Higher train speeds and heavier axle loads mean that axle bearings are more highly stressed. Despite greatest care in design and maintenance, hot boxes cannot be entirely avoided. As a result of technical rationalization, the observation of trains during running has been greatly restricted, so that means have had to be developed for the reliable detection and reporting of hot boxes. Described here are the most promising methods, their capabilities, their merits and drawbacks. A detailed price comparison is also made. The results show that the stationary hot-box locator (HOA) will be the method favoured by the DB, although the other techniques will continue to be followed with interest. [German]

Bertrand, E Hohnstadt, K *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 81-88

ACKNOWLEDGMENT: British Railways

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

DOTL JC

03 157230

#### AGING AND RENEWAL OF SHINKANSEN ELECTRIC RAILCARS

High-speed electric trains put in service when the New Tokaido Line started operating in 1964 have operated in excess of 5 million km and are now being retired in favor of new equipment. Deterioration of carbody, truck frames and electrical equipment would otherwise raise maintenance costs. The determination of economic life, method of replacement, details of the new rolling stock, and facility for dismantling the old cars are all discussed.

Katayama, S (Japanese National Railways) *Rail International* No. 3, Mar. 1977, pp 131-136, 5 Fig.

ACKNOWLEDGMENT: Rail International

ORDER FROM: ESL

DOTL JC

03 157509

#### AMTRAK'S DOUBLE-DECKERS EXPLOIT MODULAR DESIGN LIMITS

Amtrak's first new long-distance passenger coaches are now rolling off production lines at Pullman-Standard's plant in Hammond, Ind. Running tests are under way. Cars feature a two-level design which makes extensive use of modules for passenger accommodation and service equipment. Using standard components in key areas, it has been possible to build five different versions in a standard body shell. The different cars are: intermediate-distance coach/baggage; long-distance coach; dining car; sleeping car; and cafe-lounge car. All cars will be introduced progressively on transcontinental routes in fixed sets because their head-end power requirement makes them incompatible with existing equipment.

*Railway Gazette International* Vol. 133 No. 6, June 1977, pp 228-229, Photos.

ORDER FROM: ESL

DOTL JC

03 157516

#### THERMAL INSULATION OF RAILWAY VEHICLES AND POSSIBILITIES FOR IMPROVING THE SYSTEM

[Wärmeisolierung der Schienenfahrzeuge und Möglichkeiten zu ihrer Verbesserung]

No Abstract. [German]

Felsing, A *Eisenbahningenieur* Vol. 28 No. 2, Feb. 1977, pp 66-69, 2 Fig., 1 Tab., 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Dr Arthur Tetzlaff-Verlag, Niddastrasse 64, Frankfurt am Main, West Germany

03 157523

#### ESTIMATION OF THE EFFECTS OF REDUCING VEHICLE WEIGHT FROM THE TECHNICAL AND ECONOMIC VIEWPOINT

[Ocena efektów zmniejszenia ciężaru pojazdów z technicznego i ekonomicznego punktu widzenia]

The author describes a new method based on a mathematical model. He gives practical examples for using the mathematical model in the case of a railcar and a four-axle freight car. [Polish]

Baranszky, J *Pojazdy Szybowe* No. 4, 1976, pp 3-8, 1 Fig., 3 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Pojazdy Szybowe, Warsaw, Poland

03 157526

#### DETERIORATION OF RAIL-VEHICLE WHEELS CAUSED BY BRAKE BLOCKS [Degradaciones en las ruedas de ferrocarril como consecuencia del frenado con zapata]

A very detailed study of the various types of cracks, especially those caused by heat, following the action of brake blocks on wheel running surfaces. A number of illustrations accompany the explanations given in the article. The study is based on tests carried out at the CAF Laboratories (Railway Construction and Auxiliary Work). [Spanish]

Terradillos, F

Asociacion de Investigacion del Transporte No. 13, Dec. 1976, pp 41-58, 6 Fig., 54 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Asociacion de Investigacion del Transporte, Madrid, Spain

**03 157543**  
**THE 7M CONTAINER GIVES THE SJ UNIT LOAD TRAFFIC INCREASED CAPACITY [7m container ger SJ enhetslast oekad kapacitet]**

To meet the needs of containers for transport within Sweden, SJ will introduce a new 7 m container. The containers are of steel box construction and are also fitted with side doors. SJ will, at first, put 400 containers, 195 cars Lgjs and more than 30 new lorry combinations into service. Data of the new equipment are briefly given. [Swedish]

*Transportjournalen* No. 3, 1976, pp 3-5, 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Statens Jarnvagar, Commercial Department, Master Samuelsgaten 70, Stockholm C, Sweden

**03 157547**  
**THE SNCF Z 7001 TEST RAILCAR [Der Versuchstriebwagen Z 7001 der SNCF]**

The SNCF has developed a new motor truck, the Y226 for high speeds of up to 300 km/h. For tests with this truck, the Z 7001 was built using mechanical and electronic parts already in existence. First, the author describes the structural details of the Y226 bogie and the fittings and equipment of the Z 7001 test railcar. He then considers the test runs and first results obtained. [German]

Dupont, R Cossie, A *Elektrische Bahnen* Vol. 48 No. 2, Feb. 1977, pp 30-37, 3 Fig., 2 Tab., 3 Phot.

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

DOTL JC

**03 157555**  
**METHOD OF DETERMINING THE RATE IN WHICH WAGON REPAIR WORK PROGRESSES WHEN WORKING ACCORDING TO THE PRODUCTION LINE PRINCIPLE [Opredelenie technologiceskoj nadejnosti potocnoj linu po remontu gruzovyh vagonov]**

The article suggests this method on the basis of a probabilistic approach, using the mathematical principles of the theory of queues building up at several points. [Russian]

Rajkov, GV *Vestnik Vniizt* V36 N1, pp 22-25, 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

**03 157586**  
**CURRENT STATE OF DEVELOPMENT OF THE MINDEN-DEUTZ BOGIES [Zum Entwicklungsstand der Minden-Deutz-Drehgestelle]**

The author stresses that bogies of the Minden-Deutz design have found wide application ever since their development was started and that bogies of the most different designs are in use of 21 countries in the networks of state railroads, private railroads and public transport operators. The article reports on the present state of development of the Minden-Deutz bogies and on the improvements and advances that have been made both to the bogie as a unit and to its various components. [German]

Eschenauer, P (Technical University of Hannover, West Germany) *Glaser's Annalen ZEV* Vol. 101 No. 2, Feb. 1977, pp 43-48, 4 Ref.

**03 157587**  
**FATIGUE STRENGTH INVESTIGATION OF HIGH SPEED PASSENGER CAR BOGIES [Untersuchung der Ermuedungsfestigkeit Schnellaufender Drehgestelle]**

The structural design method, the fatigue tests for the sub-assemblies as well as on a complete bogie are described and the results discussed. It is

emphasized that due to the experience gained, this method will be employed more frequently on further projects. [German]

Huber, BH Soltic, J *Glaser's Annalen ZEV* Vol. 101 No. 2, Feb. 1977, pp 49-56, 8 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

**03 157684**  
**RAILWAY VEHICLE INTERNAL NOISE**

The mechanisms by which noise reaches the passenger in a rail vehicle are discussed. A summary is given of the basis on which suitable specifications for the interior noise level in a new vehicle can be selected. Methods are described by which the acoustic performance of a rail vehicle can be assessed at the design stage. Areas requiring further investigation, in particular the prediction and control of the structure-borne noise input to a vehicle, are highlighted.

Eade, PW Hardy, AEJ *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 403-415

ACKNOWLEDGMENT: British Railways  
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DOTL JC

**03 157689**  
**CORRECT USE OF ELASTOMERS IN SUSPENSION DESIGN**

The need to avoid wearing surfaces as well as isolating high-frequency vibrations and noise is causing designers to make increasing use of rubber and artificial elastomers in vehicle suspensions and linkages. Madame C. Bremond, Chief Engineer of Societe Paulstra, outlines the basic theory of rubber suspension elements, and gives examples of the way in which the need for specific spring and damping characteristics in different planes has been met for a number of successful bogie designs.

Bremond, C *Railway Gazette International* Vol. 133 No. 4, Apr. 1977, pp 150-152

ACKNOWLEDGMENT: British Railways  
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DOTL JC

**03 157690**  
**BOND SHRINKING OF WHEEL SETS OFFERS MANY ADVANTAGES ON RAILWAYS NOW AND IN THE FUTURE**

The wheel set, as a supporting, driving and guiding element of railways, continues to be of immediate interest as a result of the research activities on the wheel/rail system and in spite of the development work on new technologies. Since 1855, the wheel centres have been forced on the oversize axle seat by hydraulic pressure. This proven joining technique can be improved by metal bonding. Bond shrinking results in a considerably higher intensity of the grip between the wheel centres and the axle and in a reduction of the axle oversize to one third of that required for pressing on the wheels by hydraulic pressure. For six years, a number of carrying and driving wheel sets have been in service on combustion railcars and have covered distances up to 700,000 km. without any trouble. For this reason, a large-scale test is being implemented. The technique of bond shrinking will be further developed to permit the mounting of axle brake discs and wheels with brake blocks and the production of hollow shafts capable of withstanding cyclic bending stresses. [German]

Kurek, EG Zboralski, D *Glaser's Annalen ZEV* Vol. 101 No. 3, Mar. 1977, pp 65-75

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**03 157691**  
**DB/MBB SYSTEM HYDRAULIC WATER CLOSET: A MODERN WC FOR PASSENGER COACHES**

The WC described is the most recent development aiming at a further improvement of the sanitary installations on passenger coaches. The toilets, located at both ends of the coach, are equipped for hydraulic flushing. Dirty water is collected in an underfloor container between the headstock and the

bogie. For emptying the container, the dirty water can be discharged into a channel or extracted with a mudpump car. [German]

Klapper, H *Glaser's Annalen ZEV* Vol. 101 No. 3, Mar. 1977, pp 76-78

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DOTL JC

03 157712

**PLANNING, DEVELOPMENT AND CONSTRUCTION OF NEW DRIVER'S CABS FOR DB TRACTION STOCK**

The Central Management of the DB entrusted the DB Central Office, Munich, in autumn 1972 with the development of a "standard driver's cab for rail vehicles of the coming vehicle generation". It was required that these should have as far as possible the same operating and information elements for diesel and electric traction, and take account of the newest ergonomic findings. The equipment for preliminary operational tests was installed in the control car of a push-pull train. Already in December 1974 the first locomotive of the new Class 111 went into operation with the new driver's cab. The article describes the planning, development and construction of the new cab as adopted for the Class 111 electric locomotive. [German]

Strecker, H *Eisenbahntechnische Rundschau* Vol. 26 No. 3, Mar. 1977, 9 pp

ACKNOWLEDGMENT: British Railways

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

DOTL JC

03 157937

**WHEELSET MAINTENANCE. YESTERDAY AND TOMORROW [Wagenradsatz-Unterhaltung. Woher--Wohin]**

The author gives background details and then describes present maintenance methods in the light of rationalisation requirements and maintenance organisation methods for wheelsets. [German]

Bornemann, K *Archiv fuer Eisenbahntechnik* Vol. 31 Dec. 1976, pp 82-100, 13 Fig., 3 Tab., 5 Phot., 47 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

03 157959

**SANTA FE PUSHES FOR FREIGHT CAR RELIABILITY**

A broad program of reliability engineering has been introduced as Santa Fe's equipment has grown from 14 to 30 percent of the road's net investment over 15 years. The process is aimed at eliminating premature failures which drain maintenance dollars and shop resources while also reducing car availability. Computer files are accumulated from various reports and added data is gathered by sample inspections. Significant trends in component failure or derailment tendency are followed up by detailed failure analysis or field testing. Some of the improved and new components resulting from this program are described.

Kaelin, CR (Santa-Fe Railway) *Progressive Railroading* Vol. 20 No. 2, Feb. 1977, pp 25-28, Photos.

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

DOTL JC

03 158183

**NEW ENERGY-SAVING PRESSURIZED VENTILATION IN COACHES [Basseres Druckbelueftungsverfahren in Reisezugwagen hilft Energie einsparen]**

The ventilation method described is one which reduces energy consumption considerably; there is also a simple device for recording outside temperatures. It is used for both the heating and cooling systems, and it is thereby possible to have single-channel air-conditioning systems for coaches; energy consumption is considerably reduced and the installation is much less complex. [German]

Henatsch, A Schmidt, M *DET Eisenbahntechnik* Vol. 24 No. 12, Dec. 1976, pp 554-557, 7 Fig., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

03 158188

**FIRST NS INTERCITY TRAIN SET DELIVERED**

Now on test with Netherlands Railways are the first of seven three-car prototype trainsets designed to meet the demands of NS intercity traffic in the 1980s. They feature a number of departures from previous NS practice, in particular gangways at the ends of sets and torsionally flexible bogies. Now on test with Netherlands Railways are the first of seven

Venemans, DW Schoester, AHW *Railway Gazette International* Vol. 133 No. 4, Apr. 1977, pp 142-144, 2 Fig.

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOT JC

03 158197

**STRESS MEASUREMENTS IN RAILROAD WHEELS VIA THE BARKHAUSEN EFFECT**

The feasibility of utilizing the Barkhausen Effect in ferromagnetic steels as a nondestructive means for ascertaining residual stresses in railroad wheels was investigated. Railroad wheels are generally manufactured with compressive stress distributions in the rim to impede the propagation of fissures or thermal cracks caused by brake applications. In service, these compressive stresses may gradually become tensile, thus increasing the potential for wheel failure. Specimens examined using the Barkhausen noise measurement technique included four new wheels and two used wheels. Stress measurements from this nondestructive technique were compared with stress values determined by a dissection method of strain relaxation. Qualitative consistency in these data were observed, although testing of a larger data base will be required to determine the utility of the Barkhausen noise measurement technique for identifying those wheels which are potentially hazardous because of tensile stress buildup.

Sponsored by the FRA/U.S. DOT, through the Transportation Systems Center.

King, RR Barton, JR Perry, WD  
Southwest Research Institute, (DOT-TSC-FRA-76-32) Final Rpt.  
FRA-ORD-77/11, Feb. 1977, 86 pp, Figs., Tabs., 27 Ref., 4 App.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

PB-271215/AS, DOTL NTIS

04 053198

**APPLICATION OF THYRISTORS IN RAILWAY TECHNOLOGY: CONSEQUENCES AND REMEDIES. THYRISTOR CHOPPER CONTROL AND HARMONIC CURRENT IN TRACTION SUPPLY SYSTEMS**

This report gives a theoretical study of the factors which determine the magnitude and frequency of a.c. current in the power rails for various conditions of d.c. chopper operation. The a.c. is produced by supply voltage ripple and d.c. chopper system harmonics, comparison tests having shown that in normal working the effect of voltage ripple outweighs chopper effects. The report also discusses the application of multi-phase choppers for the purpose of reducing the size of the input filter.

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

International Union of Railways A122/RP 19/E, Apr. 1976, 29 pp, 2 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 053215

**STANDARDISATION OF THE ELECTRICAL EQUIPMENT OF PASSENGER COACHES. EVALUATION OF THE TESTS WITH SEVERAL ENERGY SUPPLY SYSTEMS FOR AIR CONDITIONED PASSENGER COACHES**

This report gives a brief description of the different energy supply systems; compared are characteristics of output, conversion system, efficiencies and installed weight. The report also describes specific tests with static converters. This report is closely connected with report B 107/RP 4, which describes the different air conditioning plants. In some points, therefore, understanding will be helped by reference to the section describing the air conditioning plant installation principle.

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

International Union of Railways B108/RP 3/E, Apr. 1976, 78 pp, 31 Fig., 6 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

04 091815

**DOT/NASA COMPARATIVE ASSESSMENT OF BRAYTON ENGINES FOR GUIDEWAY VEHICLES AND BUSES. VOLUME 2: ANALYSIS AND RESULTS**

Gas turbine engines were assessed for application to heavy duty transportation. A summary of the assumptions, applications, and methods of analysis is included along with a discussion of the approach taken, the technical program flow chart, and weighting criteria used for performance evaluation. The various engines are compared on the bases of weight, performance, emissions and noise, technology status, and growth potential. The results of the engine screening phase and the conceptual design phase are presented. (Author)

Lewis Research Center NASA-SP-354-VOL-2, 1975, 284 pp

ACKNOWLEDGMENT: NTIS  
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N75-22745/4ST, DOTL NTIS

04 146107

**DESIGN AND APPLICATIONS OF FLYWHEELS (CITATIONS FROM THE ENGINEERING INDEX DATA BASE)**

The design and varied applications of flywheels and reaction wheels are investigated in these research reports gathered in a worldwide literature survey. Such diversified applications as satellite stabilization, surface vehicle propulsion, energy transfer devices, and inertia or friction welding are reviewed. (Contains 123 abstracts)

See also NTIS/PS-76/0767.

Habercom, GEJ

National Technical Information Service Bibliog. Oct. 1976, 130 pp, 123 Ref.

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-760768/2ST, DOTL NITS

04 146108

**DESIGN AND APPLICATIONS OF FLYWHEELS (CITATIONS FROM THE NTIS DATA BASE)**

The design and varied applications of flywheels and reaction wheels are investigated in these Government-sponsored research reports. Such diversified applications as satellite stabilization, surface vehicle propulsion, energy transfer devices, and inertia or friction welding are reviewed. (This updated bibliography contains 114 abstracts, 45 of which are new entries to the previous edition.)

Supersedes NTIS/PS-75/743, and NTIS/PS-75/070. See also NTIS/PS-76/0768.

Habercom, GEJ

National Technical Information Service Bibliog. Oct. 1976, 119 pp, 114 Ref.

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-760767/4ST, DOTL NTIS

04 148604

**ELECTRIC LOCOMOTIVE OF HIGH POWER WITH COMMUTATORLESS TRACTION MOTOR FOR AC AND DC SYSTEMS**

Possibilities and consequences of the inverter technique for locomotives with three-phase traction motors are reported and compared with existing techniques. Developments by Brown Boveri & Co. AG. Mannheim are described as studies go ahead for a new DB locomotive embodying the foregoing.

Korber, J *Rail Engineering International* Vol. 6 Sept. 1976, 5 pp, 16 Fig.

ACKNOWLEDGMENT: UIC  
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DOTL JC

04 148615

**THEORETICAL AND EXPERIMENTAL DETERMINATION OF THE CHARACTERISTICS OF FUEL COMBUSTION IN A DIESEL [Rashetnoe i eksperimental'noe opredelenie kharakteristiki sgoraniya topliva v dizele]**

Based on a generalization of data on the investigation of droplet combustion of fuel, formulas are obtained for the calculation of the combustion rate coefficient in conditions of a diesel. Likewise, an algorithm for the calculation of heat emission during the combustion of a fuel spray, based on Sreznevskiy's law, is presented. Results of an experimental and theoretical determination of combustion characteristics for a section of a D49 locomotive diesel are given. A satisfactory convergence between the calculations and experiment is obtained. [Russian]

Alekseev, VP Prikhod'ko, AM *Izvestiia Vysshikh Uchebnykh Zavedenii, Mashinostr* No. 4, 1976, pp 95-98

ACKNOWLEDGMENT: EI  
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04 148623

**TESTING INSULATION PROPERTIES OF SOUTH AFRICAN RAILWAYS 3KV DC TRACTION MOTOR ARMATURES**

The development of the methods to determine the insulation characteristics of traction motor armatures, with a view to increasing service life expectancy, are discussed in this paper. Two tests, namely the measurement of the magnitude of the discharges occurring in armature insulation at maximum electrical stress under normal operating conditions and the measurement of core loss by a capacitor discharge method, are detailed. Go-no-go tests involving straightforward techniques and interpretations are superficially described. Insufficient failure data has been collected, at this stage, to enable a rigorous statistical analysis of the results; however, a single analysis is presented that indicates that these tests, as applied, will fully realize all aspirations of predicting (within statistical limits) service life expectancy.

Presented at the Symposium on High Voltage Engineering in South Africa, held in Johannesburg, November 18-19, 1974.

Simmons, PR (South African Railways & Harbours)  
Council for Scientific & Industrial Res S Africa Conf Paper S-94, 1974,  
11 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Council for Scientific & Industrial Res S Africa, P.O. Box  
395, Pretoria, South Africa

04 148818

**THE SYSTEM OF COMPOUND EXCITATION OF DC  
LOCOMOTIVE TRACTION MOTORS [Sistema smesannogo  
vzbuzdenija tjagovyh dvigatelej elektrovosov postojannogo toka]**

The article describes this system for the motors where the additional current to the main poles is supplied by a thyristor converter. It gives the relationships for calculating the basic parameters of this equipment. The system of compound excitation of a d.c. electric locomotive enables the electric rolling stock to be used at small cost in regenerative braking. [Russian]

Kosceev, LG *Vestnik Vniizt* Vol. 35 No. 6, 1976, pp 1-5, 3 Fig., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

04 149388

**MODERN ELECTRIC ROLLING STOCK OF THE ITALIAN  
STATE RAILWAYS [Moderne realizzazioni dei mezzi di trazione  
elettrica delle ferrovie dello stato]**

A report is given about the electric locomotive class E444 with shunt chopper running control, and with full chopper feeding and running control. A brief description is given of the new electric locomotive class E666 with the wheel set Co-Co and the capacity of 6000 kW. [Italian]

Bolognin, C *Elettrotecnica* Vol. 63 No. 5, May 1976, pp 445-455

ACKNOWLEDGMENT: EI

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04 149389

**FURTHER MILESTONE IN THE HISTORY OF SWISS  
ELECTRIC TRACTION, 224 STANDARD LOCOMOTIVES OF  
THE SERIES RE 4/4 II AND III ARE NOW IN SERVICE [Ein  
Weiterer Markstein in der Geschichte der Schweizerischen  
Zugfoerderung, 224 Einheitslokomotiven der Bauarten Re 4/4 II und III  
im Einsatz]**

The development of the modern electric standard locomotive is reported, including the history of locomotive design of Swiss Federal Railroads starting with World War I up to the present. The necessity of the present design is established, and its advantages and disadvantages are explained. [German]

Winter, P *Elektrische Bahnen* Vol. 47 No. 1, Jan. 1976, pp 14-18

ACKNOWLEDGMENT: EI

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DOTL JC

04 149397

**UNLOADING OF THE RAILROAD NETWORK BY THE  
SINGLE-PHASE STATIC CONVERTER WITH 2-C-LUB CIRCUIT  
[Bahnnetzentlastung durch Einphasen-Stromrichter mit 2-C-LUB-  
Schaltung]**

2-C-LUB is a quenching unsymmetrical bridge circuit with two quenching capacitors. Results of test drives with the locomotive 181,208 are reported for two cases. In one, the 2-C-LUB circuit was incorporated while in the other it was left out. These test runs have shown that a considerable reduction of network loading was realized by the incorporation of the 2-C-LUB circuit because of the large decrease of the effective value of the overcurrent and the resultant improvement of the power factor. [German]

Knuth, D Schwarzenau, R *Technische Mitteilungen AEG-Telefunken*  
Vol. 66 No. 1, 1976, pp 49-54, 8 Ref.

ACKNOWLEDGMENT: EI

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04 149398

**STATIC-CONVERTER INSTALLATIONS OF THE  
DUAL-FREQUENCY LOCOMOTIVES TYPE 181.2 AND  
MEASURES TAKEN FOR REDUCING THE NETWORK  
LOADING [Stromrichterausruistung der Zweifrequenzlokomotiven  
Reihe 181.2 und Massnahmen zur Verringerung der Netzbelastung]**

Steps taken for the reduction of network loading associated with static-converter fed power-propelled vehicles by the use of quenching static-converter bridges are discussed. The circuitry realized in type 181.2 dual-frequency locomotives of the West German Railroad System is described. Experimental results are included. [German]

Bezold, KH *Technische Mitteilungen AEG-Telefunken* Vol. 66 No. 1,  
1976, pp 41-48, 16 Ref.

ACKNOWLEDGMENT: EI

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04 149399

**RESONANCE FILTERS FOR AC LOCOMOTIVES [Rezonancni  
filtry pro stridave lokomotivy]**

The paper analyzes the possibilities of resonance filter in ac locomotives with regard to the suppression of disturbances of wire telecommunication installation. In order to obtain numerical calculation, the author sets out from a simple equivalent diagram of the circuit with a rectifier as the current source of higher harmonics and from some assumptions concerning the spectrum of the harmonics established by measurements. The results confirm some fundamental relations between the selection of the lowest filtered harmonic, the number of filters, and the resultant effect. Most of the parameters were ascertained by modeling and measuring with the use of an analog computer. The results are discussed from the viewpoint of the influence on the disturbances, on the content of higher harmonics, on the energy parameters, on the conditions in the dc circuit, and on the stress of the filter itself. [Czech]

Danzer, Z *Elektrotechnicky Obzor* Vol. 64 No. 1, 1976, pp 24-30, 4 Ref.

ACKNOWLEDGMENT: EI

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04 149411

**OPTIMISATION OF QUALITY INDICES OF COOLING  
SYSTEMS FOR SOLID-STATE DEVICES ON A.C. ELECTRIC  
LOCOMOTIVES [Optimizacija kompleksnyh pokazatelej sistem  
ohlazenija poluprovodnikovyh ustanovok elektrovosov peremennogo  
toka]**

A selection method is proposed for the optimum air flow velocity between the cooler fins, and the power gradations derived by the cooler from the head losses of the solid-state device. This method determines the technico-economic efficiency of the different cooling processes and rates of solid-state converters. [Russian]

Hazen, MM *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 11-16, 4 Fig., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

04 149412

**DETERMINATION OF THE DISTURBING CURRENT AND  
SMOOTHING FACTOR OF FILTERS ON ELECTRIC TRACTIVE  
UNITS FITTED WITH IMPULSE CONVERTERS [Opredelenie  
mesajusego toka i koefficienta sglazivaniya fil'trov EPS s impul'snymi  
preobrazovatel'jami]**

This article determines the main indices for the efficiency of smoothing filters on this type of rolling stock and proposes a method of measuring the disturbing current and smoothing factor of one and two-section filters. [Russian]

Stiben, GA Frolenkov, IN *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 21-25,  
8 Fig., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

04 149422

**THE ASYNCHRONOUS MOTOR IN ELECTRIC TRACTION [Le moteur asynchrone en traction électrique]**

The author describes in particular the operation of the inverters, the supply to the intermediate direct current circuit and the advantages of "2-quadrant" and "4-quadrant" pulsating rectifiers. He describes the Swiss BE 4/4 12 001 experimental locomotive, and discusses future prospects for this method of traction. [French]

Desponds, M *Bulletin Technique de la Suisse Romande* May 1976, pp 82-91, 22 Fig., 2 Phot., 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
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04 149450

**THE NEW USSR TEP-70 TYPE PASSENGER DIESEL LOCOMOTIVE**

The TEP-70, 160 km/h, 4000-hp, AC/DC diesel passenger locomotive was developed by the Kolomna Diesel Locomotive Plant as a solution to operating heavy freight and high-speed passenger trains over the same line. Details of solution of various design problems are given. Among the problems: Improved air and water cooling, removable modules for easy repair, and body design to simplify maintenance and provide a modern exterior.

Khlebnikov, JV (Kolomna Diesel Locomotive Plant, USSR) *Rail International* No. 11, Nov. 1976, pp 630-637, 5 Fig., 1 Tab.

ACKNOWLEDGMENT: Rail International  
ORDER FROM: ESL

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04 149456

**HEAVY-DUTY SWISS DIESELS HERALD THREE-PHASE FUTURE**

Following extensive tests with two prototypes, Swiss Federal Railways ordered in 1973 the world's first group of diesel electric locomotives with three-phase traction motors. Those six units were delivered in 1976 and CFF then ordered 10 electric locomotives with similar motors for 1979 delivery.

*Railway Gazette International* Vol. 133 No. 2, Feb. 1977, 2 pp, 1 Fig., 1 Tab., 1 Phot.

ACKNOWLEDGMENT: Railway Gazette International  
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DOTL JC

04 149977

**THE SERIES RMV HIGH-POWER RESISTANCE FOR FORCED VENTILATION [Resistance a haute puissance, serie RMV, pour ventilation forcee]**

The starting and braking resistances of electric motive units must have special characteristics. Satisfactory heat elimination makes a high load capacity possible. Fixing resistance strips with springs gives excellent safety in operation. The article describes the Series RMV resistances and describes some examples of application. [French]

Mueller, E *Brown Boveri Review* Vol. 63 No. 12, Dec. 1976, pp 729-731, 3 Phot.

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

04 149983

**FURTHER DEVELOPMENT IN THE PRODUCTION OF SKODA ELECTRIC LOCOMOTIVES [Die Weiterentwicklung in der Erzeugung der elektrischen Lokomotiven Skoda]**

The author describes the new so-called second generation electric locomotives built in Czechoslovakia. These are models 55E, 66E, 68E and 77E. The prototype of the universal dual current locomotive for freight and passenger trains alike is scheduled to be built in 1977. [German]

Opial, M *Skoda Revue* No. 2, 1976, pp 41-44

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Skoda Revue, Prague, Czechoslovakia

04 149986

**WAVEFORM OF A VOLTAGE SUPPLYING A TRACTION MOTOR ENSURING A MINIMUM VEHICLE STARTING TIME [Przebieg napiecia zasilajacego silnik trakcyjny zapewniajacy minimalizacje czasu trwania rozruchu pojazdu]**

Based on a linearized equation describing the operation of a traction motor at transient states, the waveforms of the voltage supplying a traction motor and ensuring the minimum starting time of a vehicle at maximum current limitations are determined. The waveforms obtained have the exponential form. [Polish]

Obojski, M (Warsaw Politechnic University, Poland); Grochowski, W *Przeglad Elektrotechniczny* Vol. 52 No. 1, Jan. 1976, pp 21-23, 7 Ref.

ACKNOWLEDGMENT: EI  
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04 149988

**D.C.-TO-D.C. THYRISTOR CHOPPER FOR TRACTION APPLICATION**

The paper discusses design principles together with a novel firing mode which enables the advantages of the resonant power controller to be utilized to produce a fixed-frequency chopper circuit, which has complete control over output power even at low output voltages. The resonant arrangement may be designed such that resonant currents are less than the peak load current to be commutated with a consequent reduction of the rating of the semiconductor and wound commutation components.

Farrer, W (Brush Electric Machines Limited) *Institution of Mechanical Engineers Proceedings* Vol. 123 No. 3, Mar. 1976, pp 239-244, 3 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

04 149989

**POWER PROPERTIES OF LOCOMOTIVES USING DIODES [Energeticke vlastnosti diodovych lokomotiv]**

The author points out the limited significance of the power parameters of the locomotive under normal operation in judging the actual operating conditions. For typical circumstances, the influence of various types of trains and track sections on the mean power consumption is investigated, along with the influence of some main parameters of the equipment of the power circuit of the locomotive. For this purpose, simplified calculations are used for the analysis of the locomotive, but the influence of the magnitude of the ripple is taken into consideration. [Czech]

Danzer, Z (Vyzk Lokomotiv, Skoda, Czechoslovakia) *Elektrotechnicky Obzor* Vol. 65 No. 2, 1976, pp 83-87, 1 Ref.

ACKNOWLEDGMENT: EI  
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04 152409

**STAGES IN THE EVOLUTION OF ELECTRIC LOCOMOTIVE CONSTRUCTION IN THE USSR [Etapy razvitiya otecestvennogo elektrozostroeniya]**

The article: gives the main parameters of Russian electric locomotives; shows the main alterations made to their circuits as well as their electrical and mechanical details since the start of railway electrification in the USSR; explains the pattern of future development for electric locomotives in this country. [Russian]

Bystrickij, H Ja Dubrovskij, ZM *Zheleznodorozhnyi Transport* No. 6, 1976, pp 20-25, 3 Fig., 3 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmannaya ul. 2, Moscow B-174, USSR



04 152410

**THE THREE-UNIT VL 11 ELECTRIC LOCOMOTIVE FOR FREIGHT TRAINS, WITH REGENERATIVE BRAKES****[Trehsekcionnyj gruzovoj elektrovoz VL 11 s rekuuperativnym tormozeniem]**

Examination of the technical characteristics of this 12-axle locomotive which has a regenerative brake, very high capacity (8,040 kW and is very powerful as regards haulage (59,250 kg). The operating principles of its electrical system are described both during hauling and during braking. [Russian]

Cirakadze, GI *Elektricheskaja i teplovoznaja tiaga* Vol. 20 No. 7, 1976, pp 32-33, 1 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

04 152447

**GUIDELINES FOR THE DESIGN OF SQUIRREL-CAGE ASYNCHRONOUS MOTORS SUPPLIED BY FREQUENCY CONVERTERS****[Berechnungsrichtlinien umrichter-gespeister Kafiglauber- Asynchronmotoren]**

No Abstract. [German]

Pagano, E *Elektrotechnische Zeitschrift, Ausgabe A* Vol. 97 No. 10, Oct. 1976, pp 607-611, 7 Fig., 1 Tab.

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

04 152448

**SIMULATION OF CORRELATIONSHIP BETWEEN THE OPERATING PERFORMANCE OF THE DIESEL ENGINE AND THE CHARACTERISTIC INDICES OF ITS CONDITION**

**[Modelirovanie vlijanija ekspluatacionnyh faktorov na pokazateli raboty teplovoznogo dizelja]**  
From the results of this simulation, it is possible to select two diesel parameters which show best the condition or defects of the engine. These parameters can be used to diagnose and work out the algorithm for assessing the condition of the diesel engine. [Russian]

Volodin, AI Bogatyreva, TI *Vestnik Vniizt* Vol. 35 No. 6, 1976, pp 23-27, 8 Fig., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

04 152461

**THREE-PHASE PROPULSION IN DIESEL AND ELECTRIC LOCOMOTIVES FOR HEAVY FREIGHT AND FAST PASSENGER SERVICE**

The development, prototype testing and design for production of diesel and electric locomotives with three-phase alternating current traction motors are described. The asynchronous motor, the solid-state inverter for supplying the motor, and efficiency of the electrical power conditioning system are discussed. Applications of the 35 three-phase locomotives built or on order are explained.

Presented at the 1977 Joint ASME/IEEE/AAR Railroad Conference, March 30-April 1, in Washington, D.C.

Korber, J Teich, W (Brown Boveri and Company, Limited)  
Institute of Electrical and Electronics Engineers Tech. Pap. 77CH1237-71A, 1977, pp 1-14, 36 Fig.

ACKNOWLEDGMENT: IEEE  
ORDER FROM: ESL

DOTL RP

04 152601

**GAS TURBINE TRACTION**

The present position of gas turbine traction, the requirements leading to development of the specific qualities of the vehicles, the specific characteristics of turbine trains, the general treatment of the vehicle and the investment section of the economic case, possible lines of development, and the solutions available are discussed.

Senac, G (French National Railways) *French Railway Techniques* Vol. 19 No. 3, 1976

ACKNOWLEDGMENT: EI (EIX770300107)  
ORDER FROM: ESL

DOTL JC

04 152603

**SPEED CONTROL OF D. C. MOTOR USING THYRISTOR DUAL CONVERTER**

The paper describes the design, construction and testing of a closed-loop system for the speed control of a separately excited d.c. motor fed from a dual converter. The dual converter makes possible regenerative braking and reversal of direction of rotation. There is only one firing unit and the firing pulses are diverted to the appropriate converter by a master controller. There are three control loops: one for the armature current control, one for adjusting the firing angle of the oncoming converter, and one for speed control. Proportional plus integral type of controllers have been used to achieve good dynamic and steady-state responses. Experimental results are given and compared with theoretical ones.

Krishnan, T Ramaswami, B *IEEE Transactions on Indust Elect & Control Instru* Nov. 1976

ACKNOWLEDGMENT: EI (EIX770300133)  
ORDER FROM: ESL

DOTL JC

04 152643

**A NEW CONTROL DEVICE FOR ELECTRIC LOCOMOTIVES**

**[Ein neues Steuergeraet fuer elektrischen Lokomotiven]**  
A description of the L 72 control device developed by BBC with DB collaboration. The innovations with this system mean, among other things, that tractive effort can be limited in relation to a given value by the control equipment and by simulating a characteristic curve of the adhesion coefficient. The L 72 device has been fitted on all series BR 111 locomotives since 1975. [German]

Funk, G Szabo, R *BBC-Nachrichten* Vol. 58 No. 8, Aug. 1976, pp 299-302, 4 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Brown, Boveri and Company, Kallstaedter Strasse 1, 68 Mannheim, West Germany

04 152644

**THYRISTOR CHOPPERS IN ELECTRIC TRACTION**

**[Les hacheurs a thyristors en traction electrique]**  
Theoretical studies of the parameters which affect the operation of choppers in d.c. electric traction are presented: chopper frequency, magnetic coupling, and the choice of control method for rheostatic and regenerative braking. [French]

Gouthiere, J Hologne, H *ACEC Revue* No. 1/2, 1976, pp 3/22, 29 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: ACEC-PLG/MK/AP, BP4, Charleroi 8000, Belgium

04 152784

**R-32 ENERGY STORAGE PROPULSION SYSTEM**

This paper describes a transit vehicle propulsion system which saves much of the presently wasted energy by storing the car's kinetic energy in two flywheels during vehicle braking. This stored energy is then used to accelerate the vehicle out of the station without drawing power from the wayside electric power source. The flywheel energy storage propulsion system has been installed on two New York City R-32 subway cars in place of the conventional propulsion equipment. The two cars have completed extensive testing at the Department of Transportation Test Center in Pueblo, Colorado. Extensive testing of the energy storage propulsion system cars is being carried out on the New York City Transit Authority system. At the conclusion of the test program the cars will be put into revenue service for reliability and energy saving evaluation.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

Weinstein, CH (AiResearch Manufacturing Company)  
 Institute of Electrical and Electronics Engineers Conf Paper 1975, pp  
 238-246

ACKNOWLEDGMENT: EI (EIX770200040)  
 ORDER FROM: ESL

**04 152798**  
**STATIC COMMUTATOR FOR D. C. MOTOR**

A thyristorized commutator for a d. c. motor, analogous in its operation to the conventional device, is described. By the proposed solution, turning-off of the thyristors is effected independently of the working state of the motor, thus providing a natural solution for the magnetic energy released in the armature coil during the commutation interval.

Text of "A" Paper from the IEEE Power Engineering Society Winter Meeting, New York, New York, Jan. 25-30 1976.

Naot, Y Zabar, Z  
 Institute of Electrical and Electronics Engineers, (76CH1075-1PWR) Conf  
 Paper Paper A-76-195-8, 1976, 5 pp

ACKNOWLEDGMENT: EI (EIX770200074)  
 ORDER FROM: ESL

**04 153060**  
**MORE TONNAGE...ON LESS FUEL**

A description of a device called a "fuel saver," which optimizes the fuel consumption of MU locomotives, is given. This is achieved by maintaining only the minimal number of locomotives at the optimal throttle position while maintaining the throttle of the other units at position No. 1. Potential improvements in fuel efficiency of 5% to 17% are claimed.

*Progressive Railroadng* Vol. 20 No. 3, Mar. 1977, p 67, 1 Phot.

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

DOTL JC

**04 153070**  
**MODERN D.C. TRACTION MOTOR DESIGN PRACTICE**

The article discusses electrical and mechanical design. Also covered are motor suspension, operating noise level and required ventilation.

Smith, G *Railway Engineer* Sept. 1975, pp 41-44, 1 Ref.

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

DOTL JC

**04 153071**  
**TURN-OFF CIRCUIT IMPROVES POWER FACTOR OF  
 THYRISTOR CONTROL**

Experiments carried out in cooperation with the German Federal Railway have demonstrated the feasibility of a new form of thyristor control devised by AEG-Telefunken. The effect is to improve the power factor for a thyristor-controlled locomotive, normally between 0.75 and 0.8, to between 0.9 and 0.95. Reactive power is thus reduced by about 50 percent. By addition of a quenching or turn-off circuit similar to those used in chopper control schemes for d.c. traction, the conduction period during which the thyristor is turned on can be arranged to lie centrally within the voltage half-wave, so that current and voltage are more nearly in phase. It is even possible to obtain a leading power factor if this is considered desirable.

*Railway Gazette International* Nov. 1975, p 428

ACKNOWLEDGMENT: FRA  
 ORDER FROM: ESL

DOTL JC

**04 153073**  
**OPTIMUM ADHESION CONTROL OF RAILWAY VEHICLES**

The ASEA creep control system for railway vehicles permits both individual tractive effort control on all driven axles and, where necessary, control of the total tractive effort of the vehicle. This makes it possible to utilize the maximum available adhesion under all weather conditions. Introducing this system will lead to a further increase of the tractive effort.

Soderberg, E *ASEA Journal* Vol. 48 No. 6, 1975, pp 147-149, 1 Ref.  
 ACKNOWLEDGMENT: FRA  
 ORDER FROM: ESL

**04 153074**  
**THE REGENERATIVE BRAKES OF THE THYRISTOR  
 LOCOMOTIVE EE 3/3 II OF THE SWISS FEDERAL RAILWAYS**

In 1972 the dual-frequency shunting locomotive Ee 3/3 II, No. 16502 of the Swiss Federal Railways was equipped with a new static convertor-type regenerative brake developed by Brown Boveri. The special feature of this brake is the use of the traction motor with combined differential excitation and a de-exciter. Neither a high-speed d.c. circuit-breaker nor a limiting resistor in the traction motor circuit are required to protect the static converter and traction motor in the case of inverter commutation failure. This article describes the steady and transient behavior of the main circuit during braking.

Ruegg, R *Brown Boveri Review* Dec. 1975, pp 554-557

ACKNOWLEDGMENT: FRA  
 ORDER FROM: ESL

**04 153076**  
**FOUR QUADRANT, THREE PHASE A.C. DRIVES**

This article describes a system for driving three phase a.c. motors from an a.c. catenary at unity power factor. Determines requirements and shows principle method of control. The test results are encouraging as all the requirements were satisfied. [German]

Also available from Brown Boveri & Company Limited (Postfach 351, 68 Mannheim, West Germany) as Brochure E-GVK-40076D.

Kehrman, H Lienau, W Nill, R *Elektrische Bahnen* June 1974, pp 135-142, 18 Ref.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: ESL

DOTL JC

**04 153077**  
**LINE POWER FACTOR OF THE ALTERNATIVE METHODS OF  
 SPEED CONTROL**

The author reports on results of the field evaluation of various control schemes available. The average power factor was determined by recording the watts and the VAR's during actual train operation. He concludes that the four-quadrant unity power factor control is the best. [German]

Schaefer, H *Elektrische Bahnen* Dec. 1975, pp 299-303, 6 Ref.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: ESL

DOTL JC

**04 153078**  
**DESIGN CRITERIA FOR DETERMINING THE SIZE OF  
 TRACTION MOTORS AND INVERTER OF AN  
 ASYNCHRONOUS MOTOR DRIVE**

Author reviews the fundamental relationship between electrical and mechanical parameters by means of examples. Indicates the necessity of adjusting the slip frequency in relation to the temperature of the motor for optimum torque. Deals with the question of the selection of the modulating frequency in relation to the inverter output frequency. Shows how to use a computer as a design aid. [German]

Also available from Brown Boveri & Company Limited (Postfach 351, 68 Mannheim, West Germany) as Brochure DVK-50042D.

Teich, W *Eisenbahntechnische Rundschau* Jan. 1975, pp 44-50, 1 Ref.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: Hestra-Verlag, Holzhofallee 33, 61 Darmstadt, West Ger-  
 many

DOTL JC

**04 153090**  
**GENERAL DESIGN OF THE ELECTRICAL EQUIPMENT OF  
 THE HIGH SPEED TRAINSETS [Conception generale de  
 l'equipeement electrique des rames TGV]**

These high speed trainsets are of the dual current type (25 kV 50 Hz and 1,500 V direct current) with two power cars and eight trailer cars mounted

on thirteen bogies, six of which are motor bogies. Each motor bogie is driven by two series-connected d.c. motors fixed directly to the body. In the electrical equipment there are series of thyristors, chopper units, gear for making driving simple, fixed speed regulation and antislip devices. The author describes the traction motors which give a total power of 6,200 kW (515 kW per motor) at a speed 243 km/h, as well as a 1,500 kg trainset (less than 3 kg/kW). He then gives some information about the two static supply converters for the auxiliary equipment, producing 450 kVA and each feeding the three-phase current system (380 V/50 Hz). [French]

Cossie, A (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 767-772, 3 Fig.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

**04 153091**

**APPRAISAL OF PREVIOUS HIGH SPEED TRIALS-PROVING AND PERFECTING PRE-PRODUCTION TRAINSETS [valorisation des experimentations anterieures a grande vitesse. Justification et mise a profit des rames de preserie]**

The article gives details of the chronological order and the development of high speed rolling stock from February 1954, when the world railway speed record of 243 km/h was established with the production line CC 7121 locomotive, until 1972 with the delivery of the TGV 001 gas turbine train especially designed for high speed running which exceeded 300 km/h on many occasions, and the Z 7001 (1974) electric trainset. The authors describe the scope of the high speed trials carried out with four motive power units, TGS, TGV 001, RTG 01, all three being turbotrains, and the Z 7001 electric trainset, which together covered 1,079,533 km and performed 1,369 runs at over 250 km/h, and each made its contribution to the sum total of knowledge so that the future high speed stock for commercial service could be defined. The pre-production trains to be delivered in 1978 will enable existing knowledge to be completed and new factors to be tested, such as the behaviour of articulated 8-coach trains with a power car at both ends, running two trainsets together, aerodynamics and additional resistance to forward motion because of the equipment on the roof, 25 kV 50 Hz current collection conditions, perfecting the safety installations on the line, comfort, etc. [French]

Bernard, JP Senac, G (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 755-760, 4 Fig., 1 Tab., 7 Ref.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

**04 153380**

**AUTOMATIC VARIABLE FIELD CHOPPER CONTROL SYSTEM FOR ELECTRIC RAILCARS**

1) The principle of the automatic variable field (AVF) chopper control system, 2) analysis of field characteristics, the field intensity to the chopper-conduction ratio, 3) applying the AVF system to high voltage, large capacity, high frequency chopper equipment, and 4) test results on the Chiyoda Line of Teito Rapid Transit Authority are discussed.

Presented at the IEEE/IAS 9th Annual Meeting, Pittsburgh, Pa., 7-10 October 1974.

Kitaoka, T Ohno, E Ashiya, M Katsuki, K (Mitsubishi Electric Corporation, Japan); Katta, T (Teito Rapid Transit Authority, Japan) *IEEE Transactions on Industry Applications* Conf Paper Vol. 1A13 No. 1, Paper TOD-76-8, Jan. 1977, pp 18-25, 15 Fig., 1 Tab., 4 Ref.

ACKNOWLEDGMENT: IEEE Transactions on Industry Applications  
ORDER FROM: ESL

DOTL JC

**04 153381**

**SYNCHRONOUS MOTOR RAILCAR PROPULSION**

Development of ac motor drives for rail transit car propulsion has centered on the induction motor with pulsewidth modulated (PWM) inverter control. Interest in the induction motor as a replacement for the series dc traction motor stems from the simplicity of the squirrel cage rotor of the induction motor. In this article, the short-comings of PWM inverter-induction motor transit car drive are examined. It is shown that the synchronous, or brushless

dc, motor drive can provide performance exceeding both the PWM inverter-induction motor and the conventional dc motor in the transit car application.

Presented at the IEEE/IAS 9th Annual Meeting, Pittsburgh, Pa., 7-10 October 1974.

Bourbeau, FJ (General Motors Corporation) *IEEE Transactions on Industry Applications* Conf Paper Vol. 1A13 No. 1, Paper IOD-75-57, Jan. 1977, pp 8-17, 12 Fig., 20 Ref., 1 App.

ACKNOWLEDGMENT: IEEE Transactions on Industry Applications  
ORDER FROM: ESL

DOTL JC

**04 153382**

**INVERTER-INDUCTION MOTOR DRIVE FOR TRANSIT CARS**

The advent of large power semiconductors has made it possible to apply inverters and ac motors to traction applications. Either synchronous or induction motors and several types of power converters can be considered. The induction motor and the pulsewidth modulated (PWM) inverter are selected as favorable for application to a transit car drive. A general method of sizing the PWM inverter and induction motor in terms of the car performance requirements is outlined. This method results in a minimum size inverter and allows optimization of system weight and cost. A discussion of wheel size effects and the optimization of regenerated energy is included.

Presented at the IEEE/IAS 9th Annual Meeting, Pittsburgh, Pa., 7-10 October 1974.

Plunkett, AB Plette, DL (General Electric Company) *IEEE Transactions on Industry Applications* Conf Paper Paper IOD-75-58, Jan. 1977, pp 26-37, 18 Fig., 4 Ref., 1 App.

ACKNOWLEDGMENT: IEEE Transactions on Industry Applications  
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DOTL JC

**04 153797**

**THREE-PHASE TRACTION DEVELOPMENTS**

Using asynchronous motors, three-phase locomotives may be continuously rated above the short-time traction rating of the commutator motor for passenger/freight up to 160 km/h using a common gear ratio.

Bauermeister, K (German Federal Railway) *Railway Engineer* Vol. 2 No. 2, Mar. 1977, pp 41-42, 3 Fig.

ACKNOWLEDGMENT: Railway Engineer

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

DOTL JC

**04 154556**

**HIGH-PERFORMANCE BATTERIES FOR OFF-PEAK ENERGY STORAGE AND ELECTRIC-VEHICLE PROPULSION. PROGRESS REPORT, APRIL--JUNE 1976**

The research and management efforts of the program at Argonne National Laboratory (ANL) on lithium/metal sulfide batteries during the period April--June 1976 are described. These batteries are being developed for energy storage on utility networks and for electric-vehicle propulsion. The present cells, which operate at 400 to 450 exp 0 C, are vertically oriented, prismatic cells with a central positive electrode of FeS or FeS sub 2, two facing negative electrodes of lithium-aluminum alloy, and an electrolyte of molten LiCl-KCl. Electrodes and cells are being fabricated by several industrial firms. Cells produced are being tested and evaluated--as single cells and as two- and three-cell batteries. New electrode and cell designs are being developed and tested, and promising designs will be incorporated in industrially fabricated cells. The concepts receiving major attention include the fabrication of electrodes in the uncharged state (positive electrodes of Li sub 2 S and Fe and negative electrodes of porous aluminum), the use of carbon-bonded current-collector structures in the positive electrode, the fabrication of electrodes by hot-pressing active materials and electrolyte, and the use of additives. Efforts are also under way to develop improved cell feedthroughs and electrode separators. Design work is in progress on a 30-kWh battery for a small four-passenger vehicle; this effort includes design calculations and setting specifications for the vehicle. Other battery engineering work is directed to the development of monitoring and cycling equipment and battery components. Cell chemistry studies include the

wetting of materials by molten LiCl-KCl and potentiometric measurements on metal sulfide phases. Work is continuing on the development of alternative secondary cell systems. (ERA citation 02:010092)

Argonne National Laboratories, Energy Research and Development Administration July 1976, 16 pp, 17 Fig., 11 Tab.

Contract W-31-109-ENG-38

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

ANL-76-81, DOTL NTIS

#### 04 154591

##### STUDY ON OXIDES OF NITROGEN AND CARBON FORMATION IN DIESEL ENGINES-COMPUTER PROGRAM USER'S MANUAL

This document describes the computer program and serves as a user's manual for a numerical model on THE PREDICTION OF POLLUTANT FORMATION IN DIESEL ENGINES. The model is capable of predicting both engine performance and formation of nitric oxide and soot in a direct injected diesel engine combustion process. The program is sufficiently versatile to investigate the influence of several engine parameters, such as geometry, injection timing, compression ratio, load, swirl, etc., and thus can be considered as a tool readily accessible to the design engineers. The physical and chemical processes, the detailed mathematical analysis and the assumptions upon which the model is based are discussed in the full report on this investigation. This manual contains brief descriptions of the program subroutines, program input and output. One sample case is also given to illustrate the use of the program which is designed to facilitate program check-out. The computer program is coded in standard FORTRAN IV, and a version is currently operational in CDC 6600 computer.

See also PB-262 712.

Kau, CJ Tyson, TJ  
Ultrasystems, Incorporated, Mechanical Behavior of Materials, Proceedings of, Coordinating Research Council, Incorporated, (APRAC-CAPE-20-71) Final Rpt. EPA/460/3-76/008-b, Mar. 1976, 101 pp

Contract EPA-68-01-0436

ACKNOWLEDGMENT: NTIS  
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PB-262713/1ST, DOTL NTIS

#### 04 156216

##### SOLVENTLESS SILICONE RESIN INSULATES TRACTION MOTORS FOR MAJOR RAIL VEHICLE SYSTEMS

Resin is being used to impregnate the windings of traction motors manufactured for light and heavy rail vehicles in rapid transit systems. The results include improved protection for the windings from contamination, better heat transfer, and more rigid bonding of individual wires together into a solid mass that resists vibration and shock damage.

Imanuel, H (AiResearch Manufacturing Company); Boesel, WF *Insulation/Circuits* Vol. 22 No. 13, Dec. 1976

ACKNOWLEDGMENT: EI (EIX770400220)  
ORDER FROM: ESL

#### 04 156217

##### SOME PROBLEMS IN DIESEL ENGINE RESEARCH WITH SPECIAL REFERENCE TO COMPUTER CONTROL AND DATA ACQUISITION

A versatile computer-based testing and data acquisition facility developed to improve the speed and accuracy of engine research work is described. The role of computer-aided technology is illustrated through the discussion of two quite separate problems. Fuel burning rates (heat release diagrams) are the most basic measurement of combustion, yet highly sophisticated equipment and techniques are required to obtain accurate rate diagrams. The problem is illustrated through the derivation of heat release data by analysis of averaged and smoothed cylinder pressure diagrams from naturally aspirated and turbocharged diesel engines. Techniques developed for transducer mounting, choice of sampling interval, data-logging, processing, smoothing, etc., are presented.

Marzouk, M (Imperial College of Science & Technology, England);  
Watson, N *Institution of Mechanical Engineers Proceedings* Vol. 190 No. 23, 1976, pp 137-151, 10 Ref.

ACKNOWLEDGMENT: EI (EIX770400207)  
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DOTL JC

#### 04 156224

##### ADHESION BEHAVIOR OF THYRISTOR LOCOMOTIVES DEVELOPMENTS AT THE SERIES 1043 OF AUSTRIAN FEDERAL RAILROADS (OBB)--1, 2 [Das Adhaesionsverhalten von Thyristorlokomotiven Entwicklungen bei Reihe 1043 der OBB--1,2]

Due to the increase of tractive force of modern electric locomotives greater importance has to be attributed to adhesion problems. This problem is considered using the example of various motor characteristics. The use of thyristor locomotives in Austria has made it possible to haul 20% higher train loads on steep gradients. Measures using friction up to the limit as the "Pressductor-System" are explained. The interference of telecommunication and signaling installations is discussed. [German]

Breyer, W *Elektrische Bahnen* Vol. 47 No. 4, Apr. 1976, 12 pp

ACKNOWLEDGMENT: EI (EIX770400131)  
ORDER FROM: ESL

DOTL JC

#### 04 156225

##### STARTING DYNAMICS OF A TRAIN FOR GIVEN MOTOR-CURRENT CHARACTERISTICS [Anfahrdynamik eines Zuges bei Gegebener Motorstromcharakteristik]

The starting dynamics of a train depend on the motor-current characteristics. The system of differential equations which describes the correlation is set up. Its solution with the aid of an analog computer is demonstrated with an example. [German]

Sliwa, H *Elektrische Bahnen* Vol. 47 No. 4, Apr. 1976, pp 91-94, 7 Ref.

ACKNOWLEDGMENT: EI (EIX770400133)  
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DOTL JC

#### 04 156226

##### EFFECT OF BRUSH FRICTION ON COMMUTATOR HEATING [Einfluss der Buerstenreibung auf die Kommutatorerwaermung]

If an older method was used, the measurement of commutator heating has only been possible during standstill after a haul with full power. It has been established by a new measuring method with an infrared radiation pyrometer, allowing measuring during train haul, that commutators can warm up considerably even without current with a higher rate of rpm. These and other measurements of friction are of importance in the design process. [German]

Rotter, R *Elektrische Bahnen* Vol. 47 No. 5, May 1976, pp 105-112, 4 Ref.

ACKNOWLEDGMENT: EI (EIX770400134)  
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DOTL JC

#### 04 156228

##### MODERN VEHICLE MAINTENANCE BY APPLICATION OF DIAGNOSTIC INSTALLATIONS [Fortschrittliche Fahrzeugunterhaltung durch den Einsatz von Diagnoseanlagen]

New methods are reported for checking the position of current collectors, the tire wear and the functioning of the cam-operated switch of electric railroads. The resulting increase of expenditures associated with the maintenance of electric multiple units of the Hamburg rapid transit system in West Germany are discussed. [German]

Jergas, E *Elektrische Bahnen* Vol. 47 No. 5, May 1976

ACKNOWLEDGMENT: EI (EIX770400136)  
ORDER FROM: ESL

DOTL JC

04 156229

**OPERATIONAL EXPERIENCE WITH HIGH-VOLTAGE MACHINES HAVING TOTALLY IMPREGNATED WINDINGS**

About 10 years ago the insulation of medium-sized rotating high-voltage machines was revolutionized by the introduction of a system consisting of a continuous thermosetting resin insulation with which the stator iron is impregnated under vacuum together with the winding. The main insulation is made of glass fabric and mica paper impregnated with a modified, solvent-free synthetic resin. At the same time the end-coil supports were completely redesigned; this represented a decisive improvement in the reliability of these machines, as is confirmed by successful experience with several thousand machines which have been in service for years. This article explains special operating conditions, describes practical results, and indicates possible points to be inspected. As a result of favourable experience with this insulation, machines of ratings up to and exceeding 50 Mw are now being built with this insulation.

Schuler, RH Gribet, J Scheel, J *Brown Boveri Review* Vol. 63 No. 8, Aug. 1976

ACKNOWLEDGMENT: EI (EIX770400075)

ORDER FROM: ESL

04 156882

**THREE-PHASE LOCOMOTIVE TRACTION AND ITS IMPORTANCE FOR THE FUTURE**

After detailed theoretical consideration of the characteristics of the three-phase traction system, the author describes the advantages resulting from the introduction of the collector-less asynchronous motor. Also discussed is the network behaviour of the new technique and the hitherto employed single-phase and mixed-current series motors. The advantages of the new system for electric braking are explained and the dimensioning of the main components is described. Much space is devoted to a comparison of the new traction method with the locomotive design of the 1909s. The author concludes by examining the advantages of the three-phase system for the design of the locomotive. The last section shows the extent to which the new technology has found application in wider circles. [German]

Hochbruck, H Korber, J *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 13-24

ACKNOWLEDGMENT: British Railways

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

DOTL JC

04 156885

**FLYWHEELS: ENERGY-SAVING WAY TO GO**

In operation on subway cars today, flywheel technology may be used on private cars tomorrow to help reduce pollution. Recent developments in flywheel technology are discussed such as flywheel regenerative braking, and the flywheel-heat engine hybrid. Efficiency estimates are cited.

*Environmental Science and Technology* Vol. 10 No. 7, July 1976

ACKNOWLEDGMENT: EI (EIX770400147)

ORDER FROM: ESL

DOTL JC

04 156910

**HIGH-TIME ENGINES PUSH OLD LIMITS**

General performance data of gas turbine-generator sets, used for standby service and locomotives are described.

Edwards, T *Gas Turbine International* Vol. 17 No. 5, Sept. 1976, pp 42-43

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 157222

**THE ERREN COMBUSTION CYCLE: A NEW METHOD OF UTILISING GASEOUS FUEL**

A method for adapting diesel engines to burn hydrogen gas is described, along with early tests of such prime movers. In addition to highway vehicles, the use of hydrogen-fueled diesels in locomotives and railcars is discussed.

*Automobile Engineer* Sept. 1937, pp 319-322, 9 Fig., 1 Tab.

ORDER FROM: IPC Transport Press

DOTL JC

04 157223

**HYDROGEN AS A FUEL FOR SPARK IGNITED ENGINES**

A review is made of published experimental work on engines operating on hydrogen only as a fuel. Most of this work has been done with the Waukesha CFR engine which, even in its high speed form, operates only up to 1800 rpm (30 rps). Providing steps are taken to avoid "back-firing" into the intake system, hydrogen can be used up to about 10 to 1 compression ratio even at stoichiometric mixture strength. Due, principally, to the amount of air displaced by the hydrogen compared with the partially gasified petrol charge the power output with a hydrogen fuelled engine is only about 80% that of the equivalent petrol engine. Suggestions are made for further studies which are essential if hydrogen is to be used successfully for automotive purposes. The first priority is a more extensive study of the "back-firing" phenomenon coupled with an extension of tests to much higher operating speeds.

Beard, CA

Ricardo and Company Engineers Limited DP.20933, Feb. 1976, 18 pp, 31 Fig., 2 Tab., 17 Ref.

ORDER FROM: Ricardo and Company Engineers Limited, Bridge Works, Shoreham-by-Sea, Sussex BN45FG, England

04 157224

**EXPERIMENTAL AND ANALYTICAL STUDIES OF HYDROGEN AS A FUEL IN COMPRESSION IGNITION ENGINES**

This paper presents some of the findings of an investigation into the performance of a compression ignition engine when fueled with hydrogen. Most of the experimental work reported was carried out in a laboratory dual fuel engine where hydrogen was introduced just outside the engine cylinder, mixed with the necessary air, compressed and then ignited by the injection of a small quantity of liquid fuel near the end of compression. Moreover, the role of various operating parameters on the onset of auto ignition in a motored engine in the absence of a deliberate source of ignition was also established analytically. Comparison with experimental observations is also included.

Contributed by the Diesel & Gas Engine Power Division of The American Society of Mechanical Engineers for presentation at the Diesel & Gas Engine Power Conference & Exhibit, New Orleans, La., April 6-10, 1975.

Karim, GA Klat, SR (Calgary University, Canada)

American Society of Mechanical Engineers Preprint 75-DGP-19, 1975, 8 pp, 9 Fig., 8 Ref.

ACKNOWLEDGMENT: ASME

ORDER FROM: ASME

04 157529

**THE DIESEL LOCOMOTIVE AGAINST THE DIFFICULTIES OF NATURE [La locomotive Diesel face aux climats inhumains]**

With the aid of some examples, the author reviews the technical demands made on motive units in the most inhospitable regions (high plateaus, desert and arctic regions). He describes the recent performance of various types of diesel locomotives, the efficiency of mechanical and electrical transmission systems, and the characteristics of the hydrostatic transmission with a multi-barrel piston pump coupled directly to the diesel engine. [French]

Brun, R *Industrie Nationale* No. 1, 1977, pp 3-29, 27 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Societe d'Encouragement pour l'Industrie Nationale, 15 rue Beauregard, Paris 2e, France

04 157535

**CALCULATION OF PISTON HEAT AND STRESS CHARACTERISTICS WITH ELECTRONIC COMPUTERS [Rascety teplovogo i naprjazennogo sostojanij porsnej s ispol'zovaniem EVM]**

The article examines a calculating method, in which use is made of: electrical analogy for composing electrical models of piston design diagrams, and electronic computers for calculating temperatures, heat flow, strains and stresses. This method can be used for the design of cylinder sleeves, cylinder block valves and other parts. [Russian]

Nasyrov, RA Krasocenkova, LN *Vestnik Vniizt* Vol. 36 No. 1, 1977, pp 11-15, 6 Fig., 2 Tab., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
 ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

04 157560

**CONDITIONS REQUIRED OF A THREE-PHASE CURRENT LOCOMOTIVE. PRESENT STATE OF THE ART [Anforderungen an eine Lokomotive in Drehstromtechnik Stand der Realisierung]**  
 No Abstract. [German]

Renger, W Wolters, H *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 25-32, 3 Fig., 1 Phot.

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

DOTL JC

04 157564

**POWER ELECTRONICS IN RAIL-BORNE VEHICLES**

Modern power electronics have won for themselves a permanent place in the sphere of electric traction. Semiconductor converter technology with its ever increasing range of possible applications have made a decisive contribution to a noticeable improvement in the performance, running characteristics and economics of electric motive power units. The progressive development of power electronics systems and components will continue in the future to set new standards in electric traction operation.

Uhthoff, R *AEG/Telefunken Progress* No. 3, 1976, pp 89-95, 11 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

04 157565

**SAFE USE OF DIESEL EQUIPMENT IN COAL MINES**

The author first clears some misconceptions about the safety of underground diesel equipment and examines the technical considerations involved in safe installation and operation of diesel equipment in underground gassy coal mines. Then a brief historical review of diesel locomotives underground is presented. Also discussed are the operational and safety advantages of diesels, the emission of diesel exhaust gases and ventilation, as well as the maintenance of diesel engines. Finally, the future potential for diesels in U. S. coal mines is outlined.

Proceedings of the AMC Mining Convention, set no. 5: Coal Mining 1&2, held in Denver, Colorado, September 26-29, 1976.

Alcock, K (Dresser Industries, Incorporated)  
 American Mining Congress Proceeding 1976, 51 pp, 16 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

04 157567

**ARTICULATED TRAMS '2000 SERIES' OF THE ZURICH MUNICIPAL TRANSPORT AUTHORITY**

From 1976 onward, the Zurich Municipal Transport Authority is putting a total of 60 articulated trams of the series 2001/2301 'Tram 2000' into operation. These vehicles, conceived as 'all-electric' vehicles, are equipped with electronic choppers and electronically controlled spring-loaded brakes. The author provides a concise but comprehensive description of the electrical part of the vehicle.

Baechler, U *Brown Boveri Review* Vol. 63 No. 12, Dec. 1976, pp 717-723

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

04 157571

**EXPERIMENTAL 3000 V D.C. LOCOMOTIVE OF THE ITALIAN STATE RAILWAYS WITH CHOPPER CONTROL**

The electrical equipment of an 84 t total weight locomotive is described. The locomotive is equipped with four traction motors with exclusively external excitation. Each traction motor has its own group of choppers comprising three identical units. The pulses of the three units are mutually displaced by 120 degrees. In addition to that, the four choppers groups are mutually phase-shifted by 90 degrees, so that a 12-pulse reactive effect is produced

ahead of the line filter. The continuous adjustment of traction motor voltage and current permits simple drive control.

Cogliati, A Framba, B Lanzavechia, L Mazzia, M *Brown Boveri Review* Vol. 63 No. 12, Dec. 1976, pp 737-743

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

04 157577

**ELECTRONIC CONTROL FOR THE MULTIPLE UNITS SERIES 472/473 [Elektronische Steuerung fuer die Triebzuege der Baureihe 472/473]**

The train and braking control system and its electronic devices of the multiple units series 472/473 for the rapid transit system in Hamburg, West Germany, are described. The conditions at the starting and braking and the nonskid and antislipping device are discussed. [German]

Eikermann, J *Elektrische Bahnen* Vol. 47 No. 12, Dec. 1976, pp 282-284, 5 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

DOTL JC

04 157584

**SYSTEMS ASPECTS OF ENERGY WHEELS**

Flywheels are components of a system, and system requirements dictate their design. This paper discusses some flywheel system considerations: shelf life, safety, system weight, energy density per pound of system, system dynamics, life and cost. Rim-only, magnetically-supported fiber energy wheels have great potential.

Presented at the Flywheel Technology Symposium, Berkeley, California, November 10-12, 1975. See also RRIS 04 158309 & 158311, Bulletin 7702.

Schlieben, EW (Radio Corporation of America)  
 Energy Research and Development Administration Conf Paper N 76-85, 1976, pp 40-52

ACKNOWLEDGMENT: EI  
 ORDER FROM: GPO

04 157585

**PISTONS FOR HIGH OUTPUT DIESEL ENGINES**

The author presents both the extensive range of modern diesel engine piston design and discusses the developmental history behind the varied designs. Both cast and forged pistons, in their several kinds--articulated, full-skirt, with and without cooling channel, composite--are included.

Roehrle, MD  
 Society of Automotive Engineers Preprint No. 770031, Feb. 1977, 16 pp

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

04 157589

**CHANGES IN RAILROAD TRACTION IN GERMANY [Wandel in der Zugfoerderung bei den Eisenbahnen in Deutschland]**

The development of the three kinds of railroad traction-- steam, electric and diesel traction--in the Federal Republic of Germany is discussed in a historical review. [German]

Binnewies, H (German Federal Railway) *Glaser's Annalen ZEV* Vol. 101 No. 2, Feb. 1977, pp 31-42

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

DOTL JC

04 157715

**ELECTRIC TRAIN HEATING WITH DIESEL LOCOMOTIVES**

With the replacement of steam locomotives by diesel and electric locomotives, it was natural to look to electrical energy as a heat source for passenger trains. When substantial parts of the main lines were electrified at 25 kV, the opportunity to change from steam heating to electric heating was taken. To maintain compatibility between electric and diesel locomotives some of the latter were required to be capable of providing a power source for electric

train heating. The train-heating-supply systems which became standard are discussed, together with the various means of providing these supplies from a diesel locomotive. As an example of the method generally adopted for British railways, the train-heating installation on one particular type of locomotive is described in some detail, together with some of the practical problems encountered and the solutions adopted to overcome these. As a more recent example, the heating system fitted to British Rail's new high-speed train is discussed. In conclusion, the paper attempts to indicate likely directions for future developments.

Andrew, DF *Institution of Electrical Engineers, Proceedings* Vol. 124 No. 3, Mar. 1977, pp 231-236

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

04 157918

**THE SOVIET RAILWAYS' ELECTRIC RAILCARS: THE ER-2, ER-2V, ER-22V AND ER-21 [Die elektrischen Triebzuege ER-2, ER-2V, ER-22V und ER-21 der SZD]**

Description of the electric railcars for SZD suburban traffic. The ER-2V experimental railcars are designed for 6 kV d.c. contact line voltage and the others, for 3 kV d.c. supply. [German]

Rubcinskij, ZM *DET Eisenbahntechnik* Vol. 24 No. 12, Dec. 1976, pp 539-544, 9 Fig., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

04 158208

**EFFECTIVENESS ANALYSIS OF SEARCH-TESTING**

An analysis of the effectiveness of SEARCH-testing in improving locomotive performance has been reported on. The various basic statistical techniques used in this assessment tend to indicate that the application of SEARCH-testing to locomotives could conceivably result in cost reductions under certain specific conditions. A hypothetical economic analysis does not yield conclusive results as to the desirability of a full-scale application of such a testing program. However, one could expect differing results with more complex locomotives utilized in alternate situations and under alternate conditions. One clear conclusion was the obvious need for the development of a complete locomotive reliability model. Such a model would have numerous uses and benefits.

Rawat, SK  
Canadian Institute of Guided Ground Transport, (Project 3.11.72) Final Rpt. CIGGT-74-2, June 1976, 61 pp, Figs., Tabs., 4 App.

Contract 3.11.72

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

04 158291

**INSTRUMENTATION FOR NON-CONTACT I.C. ENGINE TEST AND MONITORING**

Instrumentation has been developed for obtaining engine speed and diagnostic information for a diesel engine without mechanical or electrical connections to the engine. This non-contact technique has the potential for making diesel engine power measurement and fault diagnosis extremely simple and rapid. The method employs a single transducer held near the

engine and special purpose circuitry which extracts the engine speed information from the signal and performs spectral analysis for diagnostic purposes.

Presented at the ISA International Instrumentation Symposium, 22nd, San Diego, California, May 25-27, 1976. Also included in *Advances in Test Measurements*, V13.

Hadden, SC (Radio Corporation of America); Hulls, LR Sutphin, EM *Instrumentation in the Aerospace Industry Conf Paper* Vol. 22 1976, pp 521-528, 7 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

04 158309

**FLYWHEEL SYSTEMS APPLICATIONS**

Flywheel energy storage systems (FESS) were studied within the framework of both the near term and projected 1985-1995 technology for their applicability to the residential, commercial, industrial, transportation and utility sectors.

Presented at the Flywheel Technology Symposium, Berkeley, California, November 10-12, 1975. See also RRIS 04 157584 & 158311, Bulletin 7702.

Notti, JE, Jr (Rockwell Int Corp, Downey, Calif)  
Energy Research and Development Administration Conf Paper N76-85, 1976, pp 16-17

ACKNOWLEDGMENT: EI  
ORDER FROM: GPO

04 158311

**PROCEEDINGS--FLYWHEEL TECHNOLOGY SYMPOSIUM, 1975**

Thirty-six papers were presented at this symposium convened for the first time on flywheel technology. Specific topics include: the design and fabrication of flywheels; novel materials for their construction, such as fiberglass and Kevlar; application of flywheels in vehicles, energy storage systems, and spacecraft; magnetic levitation of flywheels.

Presented at the Flywheel Technology Symposium, Berkeley, California, November 10-12, 1975. See also RRIS 04 157584 & 158311, Bulletin 7702.

Change, GC Stone, RG  
Energy Research and Development Administration Proceeding n76-85, 1976, 294 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: GPO

04 159491

**PISTON RING SCUFFING**

This conference contains 15 papers and addresses the problem of piston ring scuffing on many different levels. Included in the conference are papers dealing with: piston ring materials; dynamic factor related to scuffing; piston ring profile; lubrication of piston rings; metallurgical aspects of scuffing; pressure measurements between piston rings and cylinders; and a survey of scuffing in spark ignition engines.

Proceedings of the Piston Ring Scuffing Conference, sponsored by the Automobile Division of the Institution of Mechanical Engineers, London, England, May 13-14, 1975. Also available from ESL.

Institution of Mechanical Engineers Proceeding CP5-1975, 1976, 26 pp

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

05 052934

**REDUCTION OF THE FILLING TIME OF THE BRAKE CYLINDER IN THE "GOODS" POSITION. ENQUIRY REPORT**

This enquiry report describes the development, in the course of time, of the UIC prescriptions relating to the braking of goods trains. It also refers to the studies effected by the 5th UIC Committee (Braking Sub-Committee) concerning: The possibility of envisaging the exclusive use of the "Passenger" brake in all trains; Examining the possibility of reducing the time of application of existing "goods" brakes; and also: The results obtained by the B 36 Specialists Committee of ORE (buffers with a high work absorption capacity). The tests of the B 36 Committee, carried out in Switzerland in 1959 and 1960, have shown that, with appropriate buffers, it is possible to brake, in all conditions and without any harmful reactions, long trains of up to 150 axles while using a brake cylinder filling time similar to that stipulated for the "Passenger train brake", e.g. 4 seconds.

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

International Union of Railways B62/RE/E, July 1962, 18 pp, 29 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

05 148821

**FRICION COEFFICIENT BEHAVIOUR OF COMPOSITE BRAKE SHOE INSERTS IN THE DAMP [Das Reibwertverhalten von Kompositionsbremssohlen bei Nasse]**

By means of bench tests the causes of drops in this coefficient have been established and there seems to be a link between this coefficient, the surface state and the pressure of the sliding film. By adding a hard abrasive product to the insert the increase in local hydrodynamic pressure is stopped so as to ensure that braking takes place in the wet. The article describes tests and results in the German Federal Republic. [German]

Jaenichen, D *DET Eisenbahntechnik* Vol. 24 No. 8, Aug. 1976, pp 349-352, 5 Fig., 3 Phot., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

05 148827

**DUAL FREQUENCY ELECTRIC LOCOMOTIVES OF THE 181103/104 TYPE WITH REGENERATIVE BRAKING [Elektrische Zweifrequenzlokomotiven 181103/104 mit Netzbremse]**

The authors describes the layout, control system and regulation of these locomotives together with the working and characteristics of the regenerative brakes. The latter afford the same operational safety as rheostatic brakes. Nevertheless, rheostatic brakes have been preferred for all new locomotives because they are more economical and less complex. Energy recuperation by means of regenerative braking is not the decisive factor. [German]

Tietze, C *Elektrische Bahnen* Vol. 47 Aug. 1976, pp 179-186, 8 Fig., 9 Ref.

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

DOTL JC

05 149457

**IMPROVING HEAT DISSIPATION WITH EDDY-CURRENT BRAKING**

The eddy-current brake developed by French National Railways has been redesigned to reduce the high temperatures produced by deceleration from very high speeds. A coil with increased air gap in non-critical areas makes this possible. A configuration which would produce eddy currents in wheels or braking discs as well as in the rail could reduce the thermal load in the rail itself where track buckling might result from passage of frequent trains being braked.

Baermann, M *Railway Gazette International* Vol. 133 No. 2, Feb. 1977, 2 pp, 1 Fig., 1 Tab., 1 Phot., 2 Ref.

ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

DOTL JC

05 149979

**ELECTRONIC CONTROL DEVICE FOR A MULTI-STAGE ELECTROMECHANICAL SPRING BRAKING SYSTEM [Elektronisches Steuergeraet fuer ein vielstufiges elektromechanisches Federspeicher-Bremssystem]**

All-electric rail vehicles without a compressed air installation require mechanical braking to replace the compressed air system. The author uses the example of the "Tram 2000" of the Zurich city transport undertaking to explain the electrically-operated spring brake with electronic control, developed by the "Ateliers de Secheron" Company. [German/French]

Werder, J *Brown Boveri Review* Vol. 63 No. 12, Dec. 1976, pp 732-736, 6 Phot.

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

05 149982

**THEORETICAL STUDIES ON PERFORMANCE AS REGARDS THE COEFFICIENT OF FRICTION OF BRAKE BLOCKS MADE OF COMPOSITE MATERIALS UNDER WET CONDITIONS [Theoretische Untersuchungen zum Reibwertverhalten von Kompositionsbremssohlen bei Nasse]**

A study is made of analogical relationships with the theory of hydrodynamic lubrication in the case of braking on the wheel by brake blocks of composite materials, when this takes place under wet conditions. The hydrodynamic thrust of the block and the coefficient of friction of the humidity are calculated and compared with test results. [German]

Jaenichen, D *DET Eisenbahntechnik* Vol. 24 No. 11, Nov. 1976, pp 501-503, 5 Fig., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

05 152789

**MAGNETIC TRACK BRAKES IN THE RAILWAY INDUSTRY**

Certain new developments and applications of magnetic track brakes are described. Typical operational information is given to assist engineers and planners in determining performance criteria.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

Tolksdorff, G Gagarin, G  
Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 382-392

ACKNOWLEDGMENT: EI (EIX770200046)  
ORDER FROM: ESL

05 153087

**BRAKING EQUIPMENT FOR THE FUTURE TRAINSETS [Les equipments de freinage des futures rames]**

The problem was to brake a weight of 410 tonnes travelling at a speed of 300 km/h on a line with gradients of 3.5% percent. Research and tests enabled the advantages and drawbacks of the different types of dynamic brakes and friction brakes to be determined at high speeds. The equipment adopted includes a rheostatic brake complying with UIC regulations on the axle motors and a disc brake on the carrying axles. All axles are also fitted with a double shoe cast iron brake applied to each wheel for speeds below 200 km/h. The authors then consider performance and the distribution of braking forces, the use of the brakes and their operation.

Romestain, P Avouac, G (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 786-791, 6 Fig., 2 Tab.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

05 156212

**HOW CASTING TECHNIQUE AFFECTS BRAKE-BLOCK WEAR**

Modern advances in railway braking systems have not yet widely superseded the conventional cast-iron brake block; metallurgical developments still



continue in an attempt to lengthen the working life of these components. The article describes the results of an investigation carried out on the wear of metal-cast shoes as against sand-cast shoes.

*Metals and Materials* Feb. 1976, pp 34-35

ACKNOWLEDGMENT: EI (EIX770400359)  
ORDER FROM: ESL

05 157525

**BRAKE SYSTEMS FOR FAST PASSENGER COACHES AND RAILCARS [Dispositivos de freno para coches rapidos de viajeros y automotores]**

Detailed study of air brakes and electric brakes together with a description of both systems. The author also examines the idea of a combined electric/mechanical brake and how such a brake could be designed. [Spanish]

Kubath, G

Asociacion de Investigacion del Transporte No. 13, Dec. 1976, pp 5-38, 43 Fig., 4 Tab., 22 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Asociacion de Investigacion del Transporte, Madrid, Spain

05 157536

**IMPROVING FREIGHT WAGON BRAKING PERFORMANCE TO TAKE ACCOUNT OF THE LIKELIHOOD OF THE WHEELS LOCKING [Povysenie tormoznoj effektivnosti gruzovyh vagonov s ucetom verojatnosti zaklinivaniya koles]**

On the basis of the results of measurements to establish wheel adhesion during braking, the article assesses the likelihood of the wheels locking in present or improved braking conditions. For lines where the ratio between the actual value and the maximum value of the adhesion coefficient of the running surface of the rails is equal to or greater than 1 to 2, the likelihood of wheel lock is 10-15% greater when braking under load and using synthetic brake shoes. On these lines, before increasing braking capacity, a system for cleaning the surface of the rails should be established. [Russian]

Kazarinov, AV *Vestnik Vniizt* Vol. 36 No. 1, 1977, pp 17-20, 3 Fig., 1 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

05 157537

**COEFFICIENTS OF FRICTION AGAINST THE RAIL FOR BRAKE SHOES ON MAGNETIC BRAKES [Koefficienty trenija basmaka magnitno-rel'sovogo tormoza]**

On the basis of experiments with a brake of this type, the article recommends empirical friction coefficient formulae for calculating the braking distances of high speed trains. [Russian]

Fokin, MD *Vestnik Vniizt* Vol. 36 No. 1, 1977, pp 20-22, 1 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

05 157556

**ANALYSIS OF EDDY-CURRENT BRAKES WITH NON-MAGNETIC ROTORS**

Theoretical calculation, using a schematic case, of the fields in the air gap for the extremely high rotational speeds at which the inductance reaction cannot be neglected and of flux and torque in relation to speed, followed by application to practical cases.

Venkataratnam, K Ramachandra, D *Institution of Electrical Engineers, Proceedings* Vol. 124 No. 1, Jan. 1977, pp 67-71, 7 Fig., 9 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Institution of Electrical Engineers, Savoy Place, London WC2R 0BL, England

05 157572

**AUTOMATIC FIXED-POINT BRAKING FOR MULTIPLE-UNIT TRAINS OF THE MILAN UNDERGROUND RAILWAY**

The author describes the automatic fixed-point braking system installed on 90 trains operating on the Milan underground. The very simple and reliable equipment is producing remarkable good results, although the rolling stock is not equipped with particularly quick-acting brakes designed for fixed-point braking.

Riondel, P *Brown Boveri Review* Vol. 63 No. 12, Dec. 1976, pp 758-762

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

05 157581

**BRAKE BLOCK DYNAMOMETER LABORATORY OF THE INDIAN RAILWAYS**

The paper describes the Brake Block Dynamometer Laboratory of the Research, Designs and Standards Organization of the Indian Railways at Lucknow, for developing the designs and materials of brake blocks, both metallic and nonmetallic, which are used in train braking. The brake dynamometer can simulate trains working up to speeds of 250 km/hr with axle loads up to 25 t. It works on the principle of gyrating masses, which can be run up to the required speeds with power supplied by a Ward-Leonard set and braking can be simulated under controlled conditions. The equipment has sophisticated electronic/electrical controls and its operation can be manual or automatic. Besides being displayed on dial and/or digital indicators, the various parameters can also be recorded with an ultraviolet recorder. A 12-channel dotted line recorder can be used for temperatures. The scope of investigations in progress and those to be taken up in future in the laboratory are also briefly described.

Mallya, BV (Ministry of Railways, India) *Institution of Eng (India) Journal, Mech Eng Div* Vol. 57 Pt. ME 4, No Date, pp 186-192

ACKNOWLEDGMENT: EI  
ORDER FROM: Engineering Society Library, 345 East 47th Street, New York, New York, 10017

06 052930

**DETONATOR OF OPTIMUM AUDIBILITY AND SAFETY.  
COMPARATIVE TESTS WITH DETONATORS**

As the B 63-Committee had been set up in order to define the characteristics of a detonator audible in the driver's cab of any motive power unit, the first task undertaken by the Committee was to develop a technique suitable for measuring the explosive power of a detonator, both in the open air and inside a driver's cab. The assessments on detonators made up to the present were merely based on subjective comparisons. The Specialists on Acoustics of the SNCF and the DB who have done their work in mutual cooperation, rapidly designed a series of measurements, enabling, by means of cathodic oscillographs, the photographic recording of the variation in air pressure caused by a detonator explosion. It has been possible to confirm the subjective classification of the detonators in current use on the SNCF, the BR, the FS and the new DB-detonators, by recording the excess pressures produced; differences in audibility corresponded with relatively large divergent pressure ratios. It will henceforth be possible to compile technical manufacturing specifications to define the explosive power of a detonator by the magnitude of the excess pressure it should produce under given conditions. The tests conducted by the DB at Rosenheim in which SNCF, BR and DB-detonators were crushed by motive power units under normal traction conditions and during which subjective and physical methods were simultaneously used, have shown, as might be expected, that the sound insulation of the driver's cabs led to a reduced audibility of the detonators. With the exception of the new DB-detonator, no detonator any longer startled the staff, as was the case during steam traction. The fragmentation has so far proved to be the reverse of a high explosive force. Although an immediate improvement could be obtained by the adoption of another fastening method to the rail for the new detonator of the DB, it nevertheless remains true that too many metallic fragments are ejected by the body of this detonator itself.

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

International Union of Railways Intrm Rpt. B63/RP 1/E, Oct. 1962, 43 pp, Figs.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 052931

**DETONATOR OF OPTIMUM AUDIBILITY AND SAFETY.  
ADDITIONAL TESTS. TECHNICAL SPECIFICATION**

Following the tests carried out by the B 63 Committee at Rosenheim in January 1962 (described in Section 3 of Interim Report No. 1), the SNCF and the DB raised with their respective detonator manufacturers the question of the development of a detonator of power equal to that of the new detonator of the DB but which would not produce a fragmentation effect endangering the staff even when located at a short distance from the actual point of explosion. The new tests carried out by the B 63 Committee at Villeneuve in February 1963 dealt with the prototypes developed by the manufacturers consulted. The results of these tests were satisfactory as both the detonator with plastic material casing submitted by the DB and the detonator with brass casing submitted by the SNCF produced an excess pressure of the same order of magnitude as that of the new DB detonator which, during the tests at Rosenheim, had been considered as being satisfactory from the point of view of explosive power. Moreover, the fragmentation produced by these two detonators was not strong enough to penetrate through a light cardboard screen arranged at 3 m from the actual point of explosion. The first task entrusted to the B 63 Committee can thus be considered as having been fulfilled and the results of the various tests can be directly used for the purpose of drafting-out the principal sections of a technical specification for the supply of new detonators.

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

International Union of Railways Intrm Rpt. B63/RP 2/E, June 1963, 18 pp, 7 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 052932

**DETONATOR OF OPTIMUM AUDIBILITY AND SAFETY.  
REPLACEMENT OF DETONATORS BY MODERN SIGNALLING  
MEANS**

The present Report gives a survey of the present use of detonators on 25 Administrations. The fields of application of the detonators can be divided into the following four groups: 1. Indication of danger in general, protection of unforeseen obstructions. 2. Supporting or replacement of visual signals. 3. Protection of trains or portions of trains having come to a stand in open track and, if necessary, protection of obstructed adjoining lines. 4. Protection of works in open track. The safety afforded by detonators as a signalling means is marked "insufficient" by only four Administrations. Ten Administrations declare to be satisfied with detonators for the purpose for which they are now used but are interested in better solutions. The other Administrations are not interested in a replacement of detonators. The remaining part of the report contains the comments of the Administrations to the means of replacement mentioned by ORE. In consideration of the replies received from the Administrations, the setting up of a Specialists Committee, proposed by ORE, is discussed in the "Conclusions."

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

International Union of Railways Intrm Rpt. B63/RP 3/E, Oct. 1964, 49 pp, 1 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 053202

**ELECTRONIC TEST INSTALLATION (VIENNA ARSENAL).  
TESTS MADE AT THE ELECTRONIC TEST INSTALLATION IN  
THE YEAR 1974/75 (FROM 1ST SEPTEMBER, 1974 TO 31ST  
AUGUST, 1975)**

This is the eighth annual report on the electronic test installation, set up in Vienna jointly by the Office for Research and Experiments (ORE) of the International Union of Railways (UIC) and the Austrian Federal Research and Test Institute for data transmission and electronics questions relating to railway engineering. The work carried out in the year covered by the report focused on two subjects: The testing of a series of data transmission equipments submitted in response to a DB tender invitation, of which reports on 4 modem types and 2 d.c. data transmission instruments are presented here. Thus, the number of modem types included in the comparison tables and curves given in Appendix B has increased to 24. Secondly, the electronic test installation carried out work for ORE Committee A 103 on the question of transmission of information through the automatic coupler. Several weeks of tests with trains were carried out by the PKP and the SNCF. A summary of this work for A 103 is given in Section C of this report. As were the earlier reports, this report is confidential and available only to the ORE Member Administrations.

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

International Union of Railways AZ32/RP 8/E, Apr. 1976, 270 pp, 128 Fig., 3 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 053211

**AUTOMATIC WARNING OF TRACK MAINTENANCE GANGS.  
ENQUIRY REPORT ABOUT THE SUITABILITY OF USING AND  
DESIGNING INDIVIDUAL WARNING DEVICES FOR STAFF  
WORKING IN THE TRACK DANGER AREA**

The report contains the opinions given by the UIC member administrations in reply to the questions asked by the A 124 Specialists Committee concerning the suitability of using and designing individual warning devices for staff working in the track danger area. In this report, the replies are analysed regarding questions on studies made, general and technical details of the development, and studies still required for the use of individual warning devices. Conclusions which are based on the analysed replies of the railway administrations are drawn. In this connection, technical studies and those concerned with industrial psychology are referred to, and proceeding from current conditions, it is estimated what problems are expected to arise from the solution of the relevant technical requirements.

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

International Union of Railways A124/RP 7/E, Apr. 1976, 28 pp, 1 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 147731

**COORDINATION OF TRAFFIC SIGNALS WITH RAILROAD GRADE CROSSING PROTECTION**

Preemption sequences for various geometric conditions are presented in figures, and criteria for adequate grade crossing preemption and coordination are listed. The preemption sequences illustrated here cover signalized intersection of 4-lane undivided roadways-2 phase operation; signalized intersection of 4-lane undivided roadways with railroad bisecting intersection-2 phase operation; signalized intersection of 2-lane roadways with railroad bisecting intersection-2 phase operation; and signalized intersection of 2-lane roadways with a railroad crossing on two approaches-2 phase operation. The recommendations presented here were developed after evaluation of information from a literature review and from contracts with engineers from states, counties, and major cities.

Abrahamson, RT Bullock, GW Dunivan, RE Flora, JW Freeman, RL Graves, PB Ireland, EF Nelson, WC, Jr Oliver, WL Riddle, RM, Jr Smith, M, Jr Taylor, SF Kirk, DD *Traffic Engineering* Vol. 46 No. 12, Dec. 1976, pp 44-47, 12 Fig.

ORDER FROM: ESL

DOTL JC

06 148582

**THE LATEST DEVELOP IN CTC**

Japanese National Railways is increasing its use of CTC to modernize its control of traffic and to reduce personnel requirements where possible. CTC application on the Shinkansen are more elaborate than those used on conventional rail line and incorporate features which will be part of the sophisticated COMTRAC control system. These developments aim at greater reliability and the handling of a greater number of information elements. This article traces evolution of CTC, indicates present status and forecasts future developments.

Nagasaki, K (Japanese National Railways) *Japanese Railway Engineering* Vol. 16 No. 2, 1976, pp 18-21, 2 Fig., 3 Phot.

ORDER FROM: ESL

DOTL JC

06 148600

**TECHNICAL AND TRAFFIC CRITERIA FOR AUTOMATIC TRAIN CONTROL AND OPERATION EQUIPMENT**

[*Trafiktekniska kriterier vid automatisering av hastighetsovervakning*]

The main part of the thesis gives the definition of the term traffic operational criteria and analyzes the parameters that have influence on the traffic capacity of a line. The accepted definitions lead to the establishment of the general formula for minimal headways between two consecutive trains and it is also applicable to all levels of automatic train control. [Swedish]

Masiewicz, A  
Royal Institute of Technology, Sweden Bulletin No. 44, 1975, 158 pp, 57 Fig., 18 Tab., 93 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: Royal Institute of Technology, Sweden, Fack S-10044, Stockholm 70, Sweden

06 148613

**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  
ORDER FROM: ESL

DOTL JC

06 148828

**TRACK CIRCUITS FOR TRACK-CLEARING CONTROL**

**EQUIPMENT [Rel'soye cepi ustrojstv kontrolja svobodnosti putej]**

The article examines the problems of the control of reception and departure track clearing using track circuits with static elements. It also gives recommendations on how these circuits should be used, and proposes an approximate calculating method for working them. [Russian]

Bryleev, AM *Avtomatika, Telemekhanika i Svyaz* Vol. 20 No. 8, Aug. 1976, pp 5-8, 7 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Mezhdunarodnaya Kniga, Smolenskaya sennaya pl 32/34, Moscow G-200, USSR

06 148829

**NEW AUTOMATIC PASSENGER TRAIN DRIVING SYSTEM**

**[Sistema avtovedenija passazirskogo poezda]**

The article describes the working algorithm and main tasks performed by means of this system, which is designed for installation on electric passenger-train locomotives. It also gives a brief description of the system's structure. [Russian]

Erofeev, EV *Avtomatika, Telemekhanika i Svyaz* Vol. 20 No. 8, Aug. 1976, pp 11-13, 1 Fig., 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Mezhdunarodnaya Kniga, Smolenskaya sennaya pl 32/34, Moscow G-200, USSR

06 149409

**STUDY OF THE PROCESS FOR ADJUSTING THE JOURNEY TIME IN THE AUTOMATIC TRAIN OPERATING SYSTEM**

**[Issledovanie processa upravlenija vremeni hoda v sistema avtovedenija poezda]**

The article shows that the problem of determining the precision of adjustment in train running time and the average number of changes in control positions, allowing for the dynamic characteristics of the operating adjustment system, can be resolved by the methods of the statistical dynamics of the automatic impulse systems. [Russian]

Erofeev, EV Golovicev, JAM *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 4-7, 1 Fig., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

06 149410

**ANALYSIS OF RESISTANCE TO INTERFERENCE OF THE CODES OF REMOTE CONTROL SYSTEMS ON ELECTRIFIED RAILWAYS**

**[Analiz pomehoustojeivosti kodov sistem telemekhaniki elektrificirovannyh zeleznych dorog]**

The article gives this analysis and calculates the stability of invariable codes and Hamming codes with additional controls. Based on the data obtained, it concludes that the use of the Hamming code in railway remote control systems is likely to be developed successfully. [Russian]

Arsinov, MN *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 7-11, 1 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

06 149414

**MEASURING SYSTEMS BASED ON THE DOPPLER EFFECT IN USE WHEN SHUNTING AND THEIR ERRORS [Gorocnye dopplerovskie izmeritel'nye sistemy i ih progresnosti]**

This article examines the problems involved in the effect of the fluctuation of the frequency of the Doppler effect on inaccuracy when measuring the

speed of a cut of cars at the hump braking point. It also gives optimum parameters for a radar speedmeter to ensure the measurement of speed with minimum error. [Russian]

Vavanov, JuV *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 59-62, 2 Fig., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

**06 149416**  
**FURTHER DEVELOPMENT OF A METHOD OF MEASURING SPEED AND LENGTH BY MEANS OF THE LASER TECHNIQUE** [Weiterentwicklung eines Verfahrens zur Messung der Geschwindigkeit und der Laenge mit Hilfe der Lasertechnik]  
No Abstract. [German]

Schulze, W  
Federal Ministry for Research and Technology Res. Rpt. T-7617, 1976, 63 pp, 3 Tab., 16 Phot., 9 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Bundesministerium fuer Forschung und Technologie, Postfach 9124, 4-10 Hessallee, 53 Bonn, West Germany

**06 149419**  
**CHOICE OF THE OPTIMUM SOLUTION FOR ORGANISING TRAFFIC ON THREE-TRACK SECTIONS OF LINE** [Vybor optimal'nogo varianta organizacii dvizenija na trehputnyh ucastkah]  
The article examines the procedure for selecting this solution for one of the three-track sections of the Soviet Donetz network, and describes experience in centralised traffic control operated according to this solution. [Russian]

Priklonskij, VV *Zheleznodorozhnyi Transport* No. 8, 1976, pp 20-23, 2 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Zheleznodorozhnyi Transport, Novo-Basmanaya ul. 4, Moscow B-174, USSR

**06 149421**  
**METHOD OF DETERMINING THE VALUE OF THE SIGNAL CURRENT IN TRACK CIRCUITS, IN A SYSTEM WITH SIGNALS AT POINTS ALONG THE TRACK AND A CENTRAL INSTALLATION FOR THE EQUIPMENT** [Metodika opredelenija veliciny signal'nogo toka v rel'sovyh cepjakh sistemy interval'nogo regulirovanija s central'nym raspolozheniem apparatury]  
An analysis of the operation of track receivers during interference is presented. The article gives the numerical characteristics for assessing their insensitivity to interference. Basic formulae are obtained for determining the value of the signal current in the track circuits. [Russian]

Minin, VA *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 49-53, 2 Fig., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

**06 149438**  
**SIGNALLING REVIEW**  
A set of 5 articles, the authors and titles of which are as follows: Wehner, L.: The growing role of electronics in signalling on the DB. Kummer, P.I.: New signalling techniques in Soviet Russia in view of automation. Weber, O.: Efficiency through simplification of signalling. Gupta, K.K.: High-voltage electric traction, signalling and telecommunications. Nagasaki, K.: A new type of centralised traffic control.

*International Railway Journal* Nov. 1976, pp 23-72, 16 Fig., 7 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48103

DOTL JC

**06 149444**  
**POSSIBILITIES OF GUARANTEEING SAFE OPERATION WITH GUIDED TRANSPORT SYSTEMS** [Moeglichkeiten zur Gewährleistung eines sicheren Betriebs bei spurgebundenen Verkehrsmitteln]

The article is a useful contribution to the search for adequate solutions to the problem of running safety for modern guided transport systems. It summarises the principles of running safety and describes, in this connection, the fail-safe technique with one or several channels and the risk concept. The authors also examine the problems that must be taken into consideration when introducing new principles for train running safety. [German]

Gayen, JT *Signal und Draht* Vol. 68 No. 10, Oct. 1976, pp 203-207, 5 Fig., 8 Ref.

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

**06 149451**  
**NON-INSULATED TRACK CIRCUITS WITH DIRECT-COUPLED RECEIVER: ANALYSIS RELATIONS, METHOD OF CALCULATION**

Expressions of transfer admittances in normal and shunt operation for direct-coupled non-insulated track circuits with and without capacitive charging are given. A method is proposed to determine the maximum length and optimum terminal resistances; on the basis of this determination conclusions can be drawn about capacitive charging. The computer program is run on an IBM 360 computer.

Iancu, OD Giuhai, R (Polytechnic Institute, Romania) *Rail International* No. 11, Nov. 1976, pp 638-645, 14 Fig., 8 Ref.

ACKNOWLEDGMENT: Rail International  
ORDER FROM: ESL

DOTL JC

**06 149959**  
**RF AND P CHECKS HOT JOURNAL DETECTORS...**  
Accidents have been caused by hot boxes undiscovered by the detector. These incidents involved defects that occurred just before passing the detector, too late to permit the heat to be transmitted to the outside of the journal box. The article describes the experimental device used to verify this assumption and later to test the efficiency of the detectors.

*Progressive Railroading* Vol. 19 No. 11, Nov. 1976, p 61, 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Murphy-Richter Publishing Company, 20 North Wacker Drive, Chicago, Illinois, 60606

DOTL JC

**06 149962**  
**PROBLEM OF HEATING DIESEL-HAULED TRAINS WITH ELECTRICITY** [Problematika elektrického vytapeni vlaku v motorove traktci]

The author deals in depth with the problem of choosing the heating system firstly and that of the return of the heating current secondly. He explains in detail the action and effects of the heating current on insulated rails especially and on the track circuits for signalling on non-electrified lines. [Czech]

Nadvornik, B *Doprava* Vol. 18 No. 2, 1976, pp 140-146, 4 Fig., 1 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Zdenka Lausmanova Ministerstvo Dopravy, Hybernska 5, Prague 1, Nove Mesto, Czechoslovakia

**06 149971**  
**THE MLL SIMPLIFIED SYSTEM DEVELOPED BY THE STANDARD ELEKTRIK LORENZ COMPANY FOR ELECTRIC INTERLOCKING CABINS** [Das SEL Stellwerksystem MLL]  
The system of electric interlocking cabins with geographical track diagram "SpDrL60" as developed for and used by the DB is not always the most economical solution. Hence the DB's decision to reduce the cost of the

system by limiting the number of switching elements while maintaining the possibility of remote-control of operation, which is vital in the case of small installations. The author describes the role of the MLL system, its implementation, the switching devices and electrical arrangements. [German]

Domzig, F *Eisenbahntechnische Rundschau* Vol. 25 No. 11, Nov. 1976, pp 655-660, 10 Fig., 2 Phot., 2 Ref.

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

DOTL JC

06 149978

**PROBLEMS WITH CASING WHEN LAYING CABLES NEAR TRACK INSTALLATIONS** [Probleme beim Verbau der Rohrleitungs- und Kabelgraben im Bereich von Gleisenlagen]  
No Abstract.

Patzschke, F *Signal und Schiene* Vol. 20 No. 9, Sept. 1976, pp 294-297, 2 Fig., 1 Tab., 10 Ref.

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

06 149990

**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 Quarterly Rpt* Vol. 17 No. 2, June 1976, pp 64-67, 3 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

DOTL JC

06 150403

**RADIO AND CTC WILL OPTIMIZE LINE CAPACITY**  
Bulk coal and iron ore movements superimposed on a general rise in traffic made it essential to equip trunk routes and key junctions with modern signalling. Once control is centralised it becomes possible for computers to take basic routing decisions, optimize movements so as to give priority to loaded trains and take other energy-saving measures. Signalling will be backed by radio to assist in regulating traffic and keep trains moving when there is an equipment failure.

Fourie, CFB *Railway Gazette International* Vol. 132 No. 12, Dec. 1976, pp 459-561

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

06 150406

**INTERFERENCE AND ITS EFFECTS ON TRACK CIRCUITS**  
This paper deals with the principal mechanisms which generate unwanted current components, together with the reaction of the various system elements, and comment is made upon the type of interference most likely to affect track circuit performance.

Hardman, AR  
Institution of Railway Signal Engineers Conf Paper Dec. 1976, 16 pp

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Institution of Railway Signal Engineers, 1 Ashbourne Close, London W5, England

06 150407

**OPERATING EXPERIENCE WITH TRAIN-TO-CONTROL RADIO**  
After the introduction of train-to-control radio on the routes Hamm-Dortmund-Cologne-Frankfurt/Mainz-Stuttgart- Munich-Salzburg/Kufstein,

the first operating results are now available. After a brief review of the trial phase, the author critically compares the hoped for advantages in safety and smoothness of operation and a better service, with actual experience. He also examines the operating staff's attitude to the new system, proneness to fault and the economic factors. [German]

Larisch, H *Eisenbahntechnische Rundschau* Vol. 25 No. 11, Nov. 1976, 6 pp

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

DOTL JC

06 151062

**THE USE OF THERMOELECTRIC GENERATORS**  
The possibilities of using thermoelectric generators (TEG) as independent power sources for signal, communications, and block systems on railroad lines, as well as for other purposes, are discussed. The advantages of the TEG over ordinary storage batteries are given. It is felt that thermoelectric generators have a promising future as power sources for railroad application and that they may well supplant storage batteries in many cases. (Author)  
Trans. of Zheleznodorozhnyi Transport (USSR) v49 n12 p56-57 1967. Distribution limitation now removed.

Matveev, GA Drabkin, LM  
Army Foreign Science and Technology Center, (FSTC-82236282301)  
FSTC-HT-23-133-68, 1968, 8 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-841809/7ST, DOTL NTIS

06 152395

**CENTRAL LINEAR CONTROL SYSTEM OF TRAIN RUNNING**  
[Poste fixe du système de contrôle linéaire de la marche des trains]  
Linear control system of train running elaborated by the Brown Boveri Company in conformity with the specifications of the ORE A46 Committee and of the UIC. The first experimental unit is in operation on the Baden-Turgi-Koblentz route of the Swiss Federal Railways. The article describes in detail the central part (the central monitoring station) of this unit after giving a general outline of it. [French]

Bogdan, V *Brown Boveri Review* Vol. 63 Sept. 1976, pp 592-597, 3 Fig., 2 Phot., 3 Ref.

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

06 152405

**ANALYSIS OF THE OPERATION OF SIGNAL BOXES BY CARRYING OUT PROGRAMMES AND CONVERTING THEM INTO LOGICAL PLANS** [Funktionsanalyse von Stellwerken durch Programmabläufe und ihre Umsetzung in Logikpläne]  
The purpose of the analysis is to identify the signal box functions and formulate them mathematically. To this end the signal box is examined as a digital automation determined from the standpoint of the theory of automations. The signal aspects (entry and exit signals) as well as the optical control panel comply with the exit parameters of the automations whereas the entry parameters comprise push-button control and train detection. [German]

Al-Hijaj, AH *Schriftenreihe des Instituts fuer Verkehr* Thesis 1976, 96 pp, 32 Phot., 59 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Institute of Traffic, Railways and Road Safety, Brunswick Technical University, Pockelsstrasse 4, Braunschweig, West Germany

06 152406

**QUALITY CONTROL--RAILWAY SIGNALLING EQUIPMENT AND SYSTEMS**  
The author defines the meaning of the terms quality, assurance and control and outlines the way in which such controls have come to be needed. He demonstrates that quality begins with the original design and then shows ways in which its maintenance can be assisted at all stages of production.

Martin, RE  
Institution of Railway Signal Engineers Preprint Nov. 1976, 16 pp, 1 Fig.,  
2 Tab., 5 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Institution of Railway Signal Engineers, 1 Ashbourne Close,  
London W5, England

**06 152453**  
**TRACTION TESTS WITH ELECTRIC TRAIN ER 200**  
[Tjagovo-energeticeskie ispytaniya elektropoezda ER 200]

The article explains the results of tests carried out on new systems and various automatic devices: automatic train driving systems, recording of running speeds and other data (High speed train ER 200). [Russian]

Gutkin, LV *Elektricheskaja i teplovoznaia tiaga* Vol. 20 No. 9, Sept. 1976,  
pp 19-22, 4 Fig., 1 App.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya  
ul. 2, Moscow B-174, USSR

**06 152462**  
**WASHINGTON METRO AUTOMATIC TRAIN CONTROL SYSTEM**

Automatic Train Control (ATC) as used by Washington Metro consists of three integrated subsystems, with each performing its separate function. The three: Automatic Train Protection (ATP), Automatic Train Operation (ATO) and Automatic Train Supervision (ATS). The computer controlled fully automated train control and its components are described.

Presented at the 1977 Joint ASME/IEEE/AAR Railroad Conference, March 30-April 1, in Washington, D.C.

Sheldon, RH (Washington Metropolitan Area Transit Authority)  
Institute of Electrical and Electronics Engineers Tech. Pap.  
77CH1237-71A, 1977, pp 42-48, 9 Fig., 1 Ref.

ACKNOWLEDGMENT: IEEE  
ORDER FROM: ESL

DOTL RP

**06 152612**  
**TESTING RADIO-CONTROL OF TRAINS AT HIGH SPEED**

Two series of tests were carried out to check the reliability of train radio control at high speed. In the first group of tests the signals were emitted from a stationary transmitter, while the the second there was an exchange of information signals between two passing trains. The results are described and discussed. [German]

Angrabeit, F Dost, P *Eisenbahntechnische Rundschau* Vol. 25 No. 12,  
Dec. 1976, pp 746-747

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

DOTL JC

**06 152613**  
**RADIO REMOTE CONTROL**

After discussing the importance of security, safety and reliability in radio remote control, the author describes the Glenayre vehicle location identification and control systems (Canadian), a G.R.S. (America) system and a Finnish State Railways system, among others.

Miller, GD  
Institution of Railway Signal Engineers Jan. 1977, 15 pp

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Institution of Railway Signal Engineers, 1 Ashbourne Close,  
London W5, England

**06 152626**  
**VERSAILLES-CHANTIERS: FIRST FREE-LEVER SIGNAL BOX WITH WIDE RANGE OF ACTION** [Versailles-Chantiers: premier PRS a grand rayon d'action]

The Versailles-Chantiers free-lever signal box handles automatic control of routing, train identification, and regulates some 600 movements per day

coming from or going to the suburbs served by Paris-Montparnasse station. When there are disruptions in the services, the movements displayed on the optical control panel and compared to the theoretical order of succession stored in the local computer can be coordinated by the signal box controller without action needing to be taken by the regional control centre. [French]

Camand, P *La Vie du Rail* No. 1577, Jan. 1977, pp 4-10

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: French National Railways, 610 Fifth Avenue, New York,  
New York, 10020

**06 152645**  
**LONDON BRIDGE RESIGNALLING**

Dealing with the resignalling of London Bridge, the authors have concentrated on new features and facilities. Their basic theme is "Train Running" and particular reference is made to the service to passengers during stage-working, the improvements made to the service by the new signalling and finally to those means adopted for the continuation of the improved train service.

Bell, RM Spencer, BF  
Institution of Railway Signal Engineers Conf Paper Feb. 1977, 18 pp, 10 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Institution of Railway Signal Engineers, 1 Ashbourne Close,  
London W5, England

**06 152676**  
**THE IMPACT OF SOPHISTICATED ELECTRONICS ON SYSTEM MAINTAINABILITY**

The impact of electronic versus relay circuitry on railroad control systems is discussed. Electronic devices are used in track circuits, classification-yard controls, traffic control systems, hot box detectors, computer interfaces and many other applications. The reliability and maintainability of electronic control systems are analyzed. Sophisticated electronic systems are more costly to acquire and more costly to maintain than the simpler system formerly used. To compete in today's transportation marketplace, they are necessary because their capabilities are so great.

Presented at the AAR Communication and Signal Section's Annual Meeting, New Orleans, Louisiana, 16 September 1975.

Schwartz, HC Rutkowski, RJ  
General Railway Signal Company Conf Paper Sept. 1975, 7 pp

ORDER FROM: General Railway Signal Company, GRS and West Avenue,  
Rochester, New York, 14602

DOTL RP

**06 152677**  
**A BASELINE AUTOMATIC TRAIN CONTROL SYSTEM INCORPORATING SYSTEM ASSURANCE CONSIDERATIONS**

Agencies responsible for rail rapid transit projects are increasingly aware of the area of system assurance, including reliability, maintainability and safety. Specifications call for contractors to include system assurance programs establishing objectives, with supporting organization, procedures and documentation. This recognizes the contribution of system assurance in determining quality of service offered. Recently this thinking has been extended to a conceptual command and control system for a rapid transit system. The conceptual system is a baseline from which final performance and hardware specifications could be developed after analysis of variations therefrom. The baseline system permits automatic operation and takes advantage of the facts that acceptable performance can be achieved without an excessive number of commands, and that recent developments in rail insulated joints offer high reliability of insulated track circuits. This permits use of power-frequency track circuits modulated by a limited number of command codes. The result is a relatively low system component count and reduction in active elements, factors with favorable impact on system availability. Principal command and control functions included in the baseline system, and subjected to system assurance analysis, include vehicle direction, speed, train separation, station stopping profile, platform positioning, door control, station dwell time, and train to wayside communication. Analysis indicates configuration variations are possible which could appreciably increase the estimate of mean time between failure while maintaining fail-safe standards of baseline system.

O'Neill, J  
General Railway Signal Company No Date, 7 pp, 3 Fig., 2 Ref.

ACKNOWLEDGMENT: General Railway Signal Company  
ORDER FROM: General Railway Signal Company, GRS and West Avenue,  
Rochester, New York, 14602

DOTL RP

06 152678

#### FAILURE MODE AND EFFECT ANALYSIS FOR SYSTEM SAFETY ASSURANCE OF ELECTRONIC CONTROLS

The need to achieve the highest levels of train safety while offering fast service with short headways leads to specification of automatic train control (ATC) as a major subsystem of rapid transit operations. Specifications recognize potential consequences of malfunction on quality of service and safety. The automatic train protection function of the ATC system must not only have acceptable failure rates but any failures which do occur must not degrade safety. The author discusses analyses of the fail-safe function: Failure mode and effect analysis (FMEA) as applied to electronics, electrical/electronic safety analysis. The way in which General Railway Signal applies these methods is described.

O'Neill, J  
General Railway Signal Company Apr. 1976, 6 pp, 1 Fig., 1 Ref.

ORDER FROM: General Railway Signal Company, GRS and West Avenue,  
Rochester, New York, 14602

DOTL RP

06 152679

#### RELIABILITY ENGINEERING: ITS IMPACT ON TRANSPORTATION CONTROL SYSTEMS

Development of Reliability and Maintainability Requirements for transportation controls is described. Reliability and maintainability can be specified, predicted and measured. Some of the methods used by General Railway Signal are described: Reliability Predictions; Apportionment-Allocation Analysis; Maintainability Predictions, Failure Mode and Effects Analysis (FMEA); Design Reviews (which include Reliability Design Criteria, Piece Part Derating & Application, and Burn-in of Piece Parts to Reduce Early Failures); and Failure Reporting-Correction Action Loop.

Schwartz, HC  
General Railway Signal Company Pamphlet 1508, May 1974, 14 pp

ORDER FROM: General Railway Signal Company, GRS and West Avenue,  
Rochester, New York, 14602

DOTL RP

06 153075

#### ELECTROMAGNETIC INTERFERENCE DUE TO LOCOMOTIVES WITH PHASE ANGLE CONTROL

The effect of thyristor control of locomotives on the operation of neighboring telecommunication circuits is discussed. Inductive (electromagnetic), capacitive (electrostatic) and ohmic effects are considered. [German]

Part 2 of the article appears in the Feb. 1974 issue of *Elektrische Bahnen*, pp 39-45.

Buckel, R *Elektrische Bahnen* Jan. 1974, pp 19-21

ACKNOWLEDGMENT: FRA  
ORDER FROM: ESL

DOTL JC

06 153086

#### SAFETY EQUIPMENT FOR THE FUTURE TRAINSETS

[Equipements de securite des futures ramés]  
Choice has been made of the "cab signal" type system and a division of the fixed block sections with transmission of characteristic currents in the track circuits which simultaneously detect trains and process data to modulate the signalling up the line on the one hand and transmit by induction in the ground-train direction the signalling information thus modulated in the driving cab on the other. The manual driving system has been adopted but it is supplemented by equipment for monitoring the driver's behaviour automatically. The author considers the technical aspects, the safety aspects and the technological choice that has been made, placing emphasis on the need for absolute reliability in the equipment. [French]

Kieken, JP (French National Railways) *Revue Generale des Chemins de Fer*  
Dec. 1976, pp 792-794

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

06 153800

#### SNCB CHOPPERS AND INTERFERENCE

Two-rail and single-rail track circuit problems are examined, the latter introducing limitation of traction-current harmonics and abolishing very long track circuit length. With greater application of thyristors, the difficulty in compliance with laid-down limitation standards is increased.

Squilbin, M (Belgian National Railways) *Railway Engineer* Vol. 2 No. 2,  
Mar. 1977, pp 55-57, 4 Fig.

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

DOTL JC

06 156205

#### LOCOMOTIVE MULTIPLE-UNIT AIR BRAKES

The brakes on a locomotive were tested for piping arrangements and conversion to two-pipe systems to determine whether it is possible for the equipment of the units to be operated together at all, and whether the controls of the units are properly positioned for compatible operation.

Gordonier, DH *Railway Age* Vol. 178 No. 1, Jan. 1977

ACKNOWLEDGMENT: EI (EIX770400499)  
ORDER FROM: Engineering Society Library, 345 East 47th Street, New  
York, New York, 10017

DOTL JC

06 156207

#### HIGHER AVAILABILITY--A RESULT OF INFLUENCE OF SYSTEM MAINTENANCE

Reliability and availability are important criteria for traffic control and railway signaling systems. Both traffic safety and functionality must be considered. The paper discusses the problem in terms of interaction of maintenance and system components, using Boolean and Markov models of reliability. Both methods are briefly compared with each other. The possibility of the use of either method is discussed. Real reliability data are used which were obtained by examination of transportation systems in action. A mathematical analysis of the basic model shows the influence of the reliability of elements, of the structure of systems, and of maintenance.

Proceedings of the INFAC/IFIP/IFORS International Symposium:  
Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976.

Fischer, K (Hochschule fuer Verkehrswesen Friedrich List); Hultsch,  
K  
International Federation of Automatic Control Proceeding 1976, pp  
97-103

ACKNOWLEDGMENT: EI (EIX770400452)  
ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pitts-  
burgh, Pennsylvania, 15222

06 156213

#### LOWER COST PROTECTION FOR RR CROSSINGS

Designs for railroad crossing gates are evaluated. Criteria for acceptance by the Federal Railroad Administration include low cost, ease of maintenance, resistance to vandalism and resistance to vehicle impact. The design best satisfying these criteria features a gate that, if impacted by a vehicle, pivots back and up along its spiral path, then returns by gravity to the horizontal position.

*Machine Design* Vol. 48 No. 23, Oct. 1976, pp 30-31

ACKNOWLEDGMENT: EI (EIX770400347)  
ORDER FROM: ESL

DOTL JC

06 156220

**TRAIN AND TRAFFIC CONTROL SYSTEMS FOR SUBWAYS**

Automatic control of trains has so far been discussed principally in terms of control of individual trains. As far as control techniques are concerned, the target seems to have been achieved. Meanwhile, with the successive introduction of practical supervisory systems that control train groups from the ground, progress is being made worldwide in the commercial application of a new type of highly efficient train control system by combining the ground-based system with the train-mounted system through a data transmission system. The high efficiency of the new system could never have been realized by individual ground or trainboard systems. This paper describes recent developments and examples of automatic train control systems with specific reference to the system for the Sapporo Municipal Transportation Bureau's Tozai Line. In this system, trains are automatically operated by transmitting data to them by very high frequency radio from the ground-based computer-aided traffic control system.

Ishida, S Takaoka, T Oshima, H Kariya, S Noumi, M Ebina, T  
*Hitachi Review* Vol. 25 No. 8, Aug. 1976

ACKNOWLEDGMENT: EI (EIX770400166)  
ORDER FROM: ESL

06 156221

**TRAFFIC CONTROL SYSTEMS FOR RAILWAYS**

Railways in Japan are shouldering ever-growing responsibilities as a means of public conveyance. Urban traffic particularly for commuters is expected to increase further in density. Consequently, speedier and more accurate operations are required for train traffic. And to secure safe and smooth transportation, new systems will be needed. Against such a background, this paper describes the latest results in computer-aided traffic control systems and outlines a few newly developed systems.

Kawai, Y Kubo, Y Oshima, H Kariya, S Kobayashi, M  
*Hitachi Review* Vol. 25 No. 8, Aug. 1976

ACKNOWLEDGMENT: EI (EIX770400167)  
ORDER FROM: ESL

06 156232

**NEW CTC FOR HEAVY TRAFFIC RAILWAY NETWORK**

An improved Centralized Traffic Control system has been developed for extensions of the Shin Kansen network. This was necessary because of shorter block section, increased need for speed controls, and the prospects for automatic train operation in the future. This new system incorporates the capability for greater transmission of information. Details of the various operating cycles of this new equipment are described.

Ohno, Y *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 3, Sept. 1976, pp 103-107, 7 Fig.

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

DOTL JC

06 156247

**RESEARCH INTO WHEEL-RAIL ELECTRIC CONTACT [Étude du contact électrique "rail-roue"]**

Research project by a student at the French National School of Public Works on the electric properties of wheel-rail contact with respect to railway signalling in particular. The author describes the parameters involved in track circuit shunting and then analyzes the causes of interference (electric resistance, disruptive discharge, etc.). He describes an experimental measuring device and proposes improvements to track circuits. [French]

Garde, A  
Ecole Nationale des Ponts et Chaussées SNCF cat. 56 N 23, July 1976, 116 pp, Tabs., Photos., Apps.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ecole Nationale des Ponts et Chaussées, 28 rue des Saints-Peres, 75007 Paris, France.

06 156257

**IMMUNISING DELHI MAIN INTERLOCKING READY FOR 25 KV 50 HZ ELECTRIFICATION**

Electrification of the Delhi-Calcutta route of Indian Railways required progressive conversion of the Delhi controls so that signal equipment would be unaffected by the high-voltage ac traction power. The modifications, the first three of which are to limit induced voltages in signalling circuits to about 120 V, consisted of replacement of unscreened cables; modification of switch and various other circuits; modification of power supply; and replacement of 50 Hz double-rail track circuits by high-voltage impulse or dc track circuits.

Gupta, K (Indian Railways) *Railway Gazette International* Vol. 133 No. 3, Mar. 1977, pp 112-114, 2 Fig., 1 Phot.

ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

DOTL JC

06 156866

**THE MODERNISATION OF SIGNALLING AND TELECOMMUNICATIONS EQUIPMENT ON THE PARIS-MULHOUSE LINE (GRETZ-BELFORT SECTION) [La modernisation des installations de securite et de telecommunications de la ligne Paris-Mulhouse (section Gretz-Belfort)]**

Modernization of signaling equipment between Gretz and Belfort (404 km) became necessary because the track circuits had to be adapted so that trains hauled by diesel locomotives could be heated electrically. This resulted in replacement of obsolete block signals by automatic color-light signaling which also enabled speed limits to be raised above 140 km/h. The engineering and modifications involved are described. Telecommunications equipment has been modernized at the same time by using trenches dug for the signal cables. A table shows the cost and return on investment. [French]

Leguay, J Henault, R *Revue Generale des Chemins de Fer* Mar. 1977, pp 161-170, 5 Fig., 4 Ref.

ORDER FROM: ESL

DOTL JC

06 156896

**TELECOMMUNICATION CABLES FOR TRAIN RADIO SYSTEMS**

To match the modulation lines to the equipment installed in fixed section radio stations, AEG-Telefunken has developed a series of building-out networks and characteristic impedance matching circuits, which may be easily combined thanks to their modular principle. In this manner the necessary matching is obtained for the various types of modulation line. Furthermore, AEG-Telefunken has designed radiating RF cables for radio communications in tunnels and the accessories required for installation.

Schnuerlein, F *AEG/Telefunken Progress* No. 1, 1976, pp 28-29

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

06 156913

**INSTALLING DRAINING TRANSFORMERS ON OVERHEAD LINES [Der Einbau von Saugtransformatoren in Oberleitungen]**

The currents flowing through the rails of a single-phase a.c. railroad affect communication and signaling circuits. In case a sufficient shielding of the cables should not be practicable, these effects are minimized by booster transformers to reduce the return current. The operating principle and the connection are described. [German]

Brudny, H *Glaser's Annalen ZEV* Vol. 100 No. 12, Dec. 1976, pp 383-38, 4 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

06 157518

**EVALUATION OF HOT BOX DETECTOR REGISTRATIONS [Utvaerdering av varmgangsdetektorers registreringsremсор]**

The article gives an abstract of the experiences from the evaluation of hot box detector registrations at SJ. General conclusions concerning the



influence of car weight and rigidity on box temperature are stated. Average maximum registrations from rapid passenger and freight trains recorded in different seasons and on different tracks are listed. The article also includes a specific study. The container cars Slps were subjected to special measurements concerning flange thickness, height and QR because these cars are provided with test wheels. [Swedish]

Bengtsson, B *Jarnvagsteknik* Vol. 44 No. 2/3, 1976, pp 31-33, 3 Fig., 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48103

06 157524

**A CENTRALLY-CONTROLLED SECTION OF LINE FOR TWO-WAY WORKING. THE FIRST APPLICATION OF AN AXLE-COUNTER BLOCK SYSTEM IN FRANCE** [Section de voie banalisée a commande centralisée. Première application en France du block par compteurs d'essieux]

A description of the centralised control installation on the single-track line between Saint-Andre-Le-Gaz and Chambéry. The control centre co-ordinates all traffic, and controls the signalling and safety devices over 43 km of line equipped with an axle-counter block system. [French]

Avenas, J *La Vie du Rail* No. 1583, Mar. 1977, pp 4-10, 17 Phot., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: French National Railways, 610 Fifth Avenue, New York, New York, 10021

06 157530

**AXLE COUNTERS IN THE DB. A REVIEW OF DEVELOPMENT AND PRESENT SITUATION** [Achzahler bei der DB. Entwicklungsrueckblick und gegenwaertiger Stand]

The author reviews past development, describes magnet-type axle counters, and mentions the scope of use of this technique. He explains the working of electronic axle counters of the types constructed by SEL and Siemens. He concludes with a discussion of the present state of development of axle counters and the tasks they will carry out in the future. [German]

Schmidt, W *Signal und Draht* Vol. 69 No. 1/2, Jan. 1977, pp 12-20, 4 Fig., 7 Phot., 6 Ref.

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

06 157539

**THE "COMBINED SYSTEM": A NEW SYSTEM FOR IMPROVING THE PROBLEM OF SIGNAL REPECTION ON LOCOMOTIVES**

This paper deals with the problem of cab signalling and, more specifically, the choice of the most appropriate system in view of the extension of cab signalling over the entire network. After recapitulating the main characteristics of the two existing systems--continuous and discontinuous-- the author demonstrates how it is possible to benefit from the advantages of both systems. While the ground installations may be either continuous or discontinuous over the network as a whole, the cabs are being equipped with combined type equipment, to function with either system according to the ground installations on the line in question and the required safety margin.

Russo-Frattasi, A *Rail International* Vol. 8 No. 3, Apr. 1977, pp 193-201, 10 Fig., 3 Tab., 15 Ref.

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

DOTL JC

06 157551

**DEVELOPMENT OF A NEW VOLTAGE CUT-OUT FOR D.C. CURRENT LINES ON THE NS** [Neuentwicklung einer Spannungssicherung fuer Gleichstrombahnen der Niederlaendischen Eisenbahnen]

Railway signalling systems use the rails for transmitting information and for detection. Difficulties obviously arise in that rails are used for conducting

electric traction current. Because of return currents and the possibility of short circuits with the contact wire, unacceptable differences in potential may occur between ground wires and rails. To protect against this, voltage cut-outs are fitted. The authors describe cut-outs that meet NS requirements and give details of test and operational results. [German]

Baumgartel, K *Elektrische Bahnen* Vol. 48 No. 2, Feb. 1977, pp 46-50, 2 Fig., 4 Phot.

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

DOTL JC

06 157554

**CRITERIA AS REGARDS THE EFFICIENCY OF THE AUTOMATIC BLOCK SYSTEM IN TERMS OF RELIABILITY** [Kriterii effektivnosti funkcionirovanija avtoblokirovki s ucetom ee madeznosti]

The article establishes the mathematical correlation between the criteria and the degree of reliability. These criteria fix the optimum degree of reliability and when it is necessary to overhaul the automatic block system taking into account, on the one hand, the minimum amount that damage due to the failure of the block to function reliably would cost and, on the other hand, the minimum cost of producing and operating this system. The method considered can also be used for determining the operational efficiency of: centralized traffic control and electricity supplies, and automatic shunting equipment. [Russian]

Abramov, VM *Vestnik Vniizt* Vol. 36 No. 1, 1977, pp 51-54, 2 Fig., 1 Tab., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

06 157573

**RADIO SYSTEM OF THE SIHLTAL-ZURICH-UETLIBERG RAILWAY**

In the course of rationalization measures of the Sihltal-Zurich-Uetliberg railway, the zone tariff system with station-based ticket machines and one-man train crews was introduced at the end of 1975. The radio system ensures the connection with the dispatching centre, so that the engine driver is not completely left to his own devices. It also permits remote control of level-crossing barriers and the transmission of the passage report to the signal system. Until now, these operations could not be carried out from the train.

Saugy, F Hefti, E *Brown Boveri Review* Vol. 63 No. 12, Dec. 1976, pp 763-764

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

06 157667

**RESIGNALLING--A TEAM EFFORT**

In the London Bridge resignaling, the interlocking plants were so closely spaced that the entire area has to undergo comprehensive planning. It was necessary to rearrange the track layout, install a complete new signal system and develop a complete new timetable for one of the heaviest passenger traffic sections of the British Railways. The various stages of planning and implementation are outlined, indicating particularly the interdepartmental relationships necessary. The fact that the 1926 signaling was obsolete and the operation of commuter trains at near saturation levels has evolved made the project necessary.

Brown, DG (British Railways) *Railway Engineer* Vol. 2 No. 3, May 1977, pp 11-16

ORDER FROM: ESL

DOTL JC

06 157699

**TRACK CIRCUIT RESEARCH PROJECT BIBLIOGRAPHY**

This publication contains abstracts of journal articles and research reports selected by the AAR from North American and West European railroad literature. This material covers only the area of track circuits, and

concentrates on the electrical properties of the track rather than the electrical characteristics of the transmitting and receiving equipment associated with track circuits. This publication contains an author, title, and keyword index.

Hartmann, PW

Association of American Railroads Technical Center Bibliog. R-254, Feb. 1977

ACKNOWLEDGMENT: AAR

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

DOTL RP

06 157916

**HIGH FREQUENCY RADIANT CIRCUITS IN TELEVISION EQUIPMENT USED ON PASSENGER PLATFORMS ON THE MUNICH S-BAHN** [Abstrahlende Hochfrequenzleitungen in Fernsehanlagen zur Bahnsteigbeobachtung des Personenverkehrs bei der S-Bahn Muenchen]

The DB carried out an experiment on the urban/suburban railways (S-Bahn) in Munich for transmitting pictures of passenger platforms to a TV screen in the driver's cab. The authors describe the system used for relaying the

picture to the screen and explain in detail how the transmitting aerial, which is a high frequency radiant circuit set in the track, works. They also describe how this device is made and installed. [German]

Casperlein, H Stapff, A Wanser, G Breitenbach, O *Elektrische Bahnen* Vol. 47 No. 11, Nov. 1976, pp 262-265, 5 Phot., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

06 158181

**SIGNALLING TECHNOLOGY FOR NEW OPERATING DEMANDS**

A brief description of the most recent signalling techniques used on the FS is given.

Liverani, A *International Railway Journal* Dec. 1976, 5 pp, Photos.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Simmons-Boardman Publishing Corporation, 508 Birch Street, Bristol, Connecticut, 06010

DOTL JC

07 090456

**BLOOD-ALCOHOL PROFICIENCY TEST PROGRAM**

A preliminary survey has been performed to ascertain the validity of the blood alcohol analysis performed by a number of laboratories on a voluntary basis. Values of accuracy and precision of the tests are presented.

Flores, AL

Transportation Systems Center, National Highway Traffic Safety Administration Intrm Rpt. DOT-TSC-NHTSA-74-5, Jan. 1975, 21 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-239849/3SL, DOTL NTIS

07 148598

**STUDIES ON AGE AS A FACTOR IN REACTIONS TO EXTERNAL OCCURRENCES [Untersuchungen ueber alterstypische Reaktionsablaeufe]**

One essential conditions for transport safety is that the driver of a vehicle must be able to react quickly to any event. 2680 reactions by 910 persons were examined to determine to what extent age was a factor in the time taken to react to an external occurrence. The author notes that the act of responding does not depend on age, but that there is a relationship between age and perception time. [German]

Buerkner, A *TUE-Sicherheit und Zuverlaessigkeit in Wirtschaft* Vol. 16 No. 3, 1975, pp 79-80, 5 Tab., 2 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: VDI-Verlag GmbH, Postfach 1139, Graf-Recke-Strasse 84, Duesseldorf, West Germany

07 148833

**THOUGHTS ON THE MONOTONOUS HYPNOTICAL NATURE OF RAILWAY TRAIN DRIVING [Ueber monoton-hypnoide Zustände beim Fahren schienengebundener Triebfahrzeuge]**

No Abstract. [German]

Koschlig, G *Verkehrsmedizin und Ihre Grenzgebiete* Vol. 23 No. 7, July 1976, pp 265-273, 1 Fig., 1 Phot., 38 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

07 149417

**RUNNING SPEED AND HEART-BEAT RATE OF ENGINE DRIVERS (TELEMETRIC EXAMINATIONS) [Fahrgeschwindigkeit und Herzfrequenz bei Lokfuhrern (telemetrische Untersuchungen)]**

No Abstract. [German]

Sadowski, Z *Aerztlicher Dienst der DB* Vol. 37 No. 1/2, Jan. 1976, pp 11-12, 2 Phot., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Aerztlicher Dienst der DB, German Federal Railway, Darmstadt, West Germany

07 149955

**ANALYSIS OF THE RESULTS OF TESTS ON PKP EMPLOYEES IN CONTACT WITH EPOXY RESINS [Beurteilung der Untersuchungsergebnisse bei Beschaeftigten der PKP, die dem beruflichen Kontakt mit Epoxyhartz ausgesetzt sind]**

No Abstract. [German]

Zawadzka, M Wilczynskaja-Ilecka, L *Verkehrsmedizin und Ihre Grenzgebiete* Vol. 23 No. 8/9, Aug. 1976, pp 326-327, 3 Tab., 1 Phot., 23 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

07 149956

**ANALYSIS OF THE RESULTS OF INTELLIGENCE AND PERSONALITY TESTS ON APPLICANTS FOR THE JOB OF ENGINE DRIVER [Auswertung der Ergebnisse der Intelligenz- und Personenlichkeitsuntersuchungen von neueinzustellenden Lokfueherranwaertern]**

No Abstract. [German]

Kleiniger, O *Verkehrsmedizin und Ihre Grenzgebiete* Vol. 23 No. 8/9, 1976, pp 317-320, 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

07 149957

**INFLUENCE OF JOURNEY AND LOCOMOTIVE DRIVING CONDITIONS ON THE PULSE RATE [Einfluss verschiedener Fahrtvarianten der Lok auf die Dynamik der Herzfrequenz]**

No Abstract. [German]

Czyzewska, E *Verkehrsmedizin und Ihre Grenzgebiete* Vol. 23 No. 8/9, Aug. 1976, pp 338-346, 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

07 149961

**WORKING CONDITIONS IN THE LOCOMOTIVE DEPARTMENT AND THEIR EFFECT ON DRIVING SAFETY [Arbeitsbedingungen im Triebfahrzeugdienst und ihr Einfluss auf die Handlungssicherheit des Triebfahrzeugfuhrers]**

No Abstract. [German]

Schnabel, H *Eisenbahnpraxis* Vol. 20 No. 9, Sept. 1976, pp 313-314, 3 Fig., 1 Tab., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

07 151990

**OCCUPATIONAL SKIN DISEASES IN THE GERMAN FEDERAL RAILWAY [Berufdermatosen bei der Deutschen Bundesbahn]**

No Abstract. [German]

Mattil, K *Aerztlicher Dienst der DB* Vol. 36 No. 7-8, July 1975, pp 87-95, 5 Fig.

ACKNOWLEDGMENT: UIC

ORDER FROM: German Federal Railway, Darmstadt, West Germany

07 152616

**A CRITICAL ASSESSMENT OF STUDIES RELATING WHOLE-BODY VIBRATION TO PASSENGER COMFORT**

This paper critically reviews the major work which has been carried out over the past 40 years to investigate the relationship between whole-body vibration and comfort. Although a fair amount of work has been completed in this area, this review demonstrates that the majority is unacceptable from most practical stand-points although some concordance exists. Finally, the paper shows that attempts which have been made to draw the field together (including an International Standard) to produce curves of equal comfort have not significantly increased our knowledge of how people react to whole-body vibration.

Osborne, DJ *Ergonomics* Vol. 19 No. 6, Nov. 1976, pp 751-774

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

07 152632

**PSYCHOLOGICAL AND PHYSIOLOGICAL ASPECTS OF TRAIN RUNNING WITH ONE DRIVER ONLY [Psycho-physiologische Aspekte bei der Ein-Mann-Besetzung von Triebfahrzeugen]**

No Abstract. [German]

Kiczka, K Czyzewska, E *Zeitschrift der OSShD* Vol. 19 No. 3-4, 1976, pp 19-23, 7 Fig., 13 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Organization for the Collaboration of Railways, Komitee fuer Eisenbahnverkehr, Hoza 63/67, Warsaw, Poland

07 153360

#### ENGINEMEN'S SENSITIVITY STUDIES

As part of the Track Train Dynamics Program, Transportation Systems Center studied the role of the locomotive engineer in train handling. This report, covering efforts to December 1974, discusses the development of the active digital data acquisition system, the study of engineman sensitivity, development of the train mass distribution graph, the development and use of the Draft-Buffer Indicator, and the vibration environment of the cab. The response of enginemen to car instruments and to cab accelerations and shocks as a means of determining train performance are discussed.

Association of American Railroads Technical Center, Federal Railroad Administration, Railway Progress Institute, Transportation Research and Development Center R-188, Apr. 1976, 126 pp, 57 Fig., 3 App.

ACKNOWLEDGMENT: AAR

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

DOTL RP

07 153392

#### PROGRAM DESIGN TO DEFINE RIDE QUALITY REQUIREMENTS OF SURFACE TRANSPORTATION VEHICLES

A plan was developed for evaluation of the relationship between ride and ride quality of vehicles currently used in public transportation systems and new prototypes. The components of ride as the physical environment and ride quality as passengers response were defined and articulated. Three settings were recommended for conduct of research: a simulator, rides by captive passengers and rides by revenue passengers. A procedure was described for the implementation of experimental studies. Key features involved accumulation of a growing data bank describing ride-ride quality relationships and forecasting results of future experiments from the data bank. An experiment was conducted in the NASA Langley simulator to examine the relationships between ride vibrations derived from actual railway track signatures and ride quality as rated by subjects. When the design was replicated, comfort ratings by subjects were highly reliable. Subjects could discriminate between stimulus amplitudes for continuous rough track and diamond crossings; they could not discriminate amplitude variations well for roll. These data fail to show that subjects can discriminate well between the different types of vibration that define ride.

Havron, MD Westin, RA *Human Factors* Vol. 18 No. 6, Dec. 1976, pp 551-564

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

07 155352

#### MAINTAINING ALERTNESS IN RAILROAD LOCOMOTIVE CREWS

The problem of assuring alertness in railroad locomotive crews is defined. Principles for maintaining alertness are derived from the experimental literature on vigilance and several unresolved questions are explored through three experiments. The findings are summarized in a set of criteria for evaluating alerting devices and techniques, and devices currently in use on the railroads are evaluated against these criteria. Recommendations are offered for improving current devices and for exploring new techniques.

Devoe, DB Abernethy, CN  
Transportation Systems Center, Federal Railroad Administration Final Rpt. DOT-TSC-FRA-76-29, FRA/ORD-77/22, Mar. 1977, 68 pp, 4 Fig., 4 Tab., Refs.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-266273/2ST, DOTL NTIS

07 156352

#### VIBRATION RIDE COMFORT CRITERIA

Results from a test program at Langley Research Center to develop an empirical model for predicting passenger comfort responses to multi-axis vibrations are restricted to a description and understanding of human response to complex vertical axis vibrations. The approach to multifrequency vibration includes a separate consideration of the discomfort associated with each frequency component or band of the total spectrum, and a subsequent empirical weighting of the discomfort components of these frequency bands when in various random combinations.

Presented at the Congress of the International Ergonomics Associations, 6th, and Technical Program of the Annual Meeting of the Human Factors Society, 20th, University of Maryland, College Park, July 11-16, 1976.

Dempsey, TK (NASA Langley Research Center); Leatherwood, JD  
Human Factors Society Proceeding 1976, pp 260-266, 16 Ref.

ACKNOWLEDGMENT: EI (EIX770400096)

ORDER FROM: Human Factors Society, 1134 Montana, Santa Monica, California, 90403

07 156433

#### VIBRATION SIMULATOR STUDIES FOR THE DEVELOPMENT OF PASSENGER RIDE COMFORT CRITERIA

A test programme to determine the total discomfort associated with vehicle vibration is described. The programme utilizes a three-degree-of-freedom vibration simulator to determine the effects of multifrequency and multi-axis vibration inputs. The approach to multifrequency vibration includes a separate consideration of the discomfort associated with each frequency component or band of the total spectrum and a subsequent empirical weighting of the discomfort components of these frequency bands when in various random combinations. The results are in the form of equal discomfort curves that specify the discomfort associated with discrete frequencies between 1 and 30 hz and different acceleration levels. These results provide detailed information of the human discomfort response to increases in acceleration level for each frequency investigated. More importantly, the results provide a method for adding the discomfort associated with separate frequencies to give a total typification of the discomfort of a random spectrum of vibration. /Author/ /TRRL/

Dampsey, TK Leatherwood, JD *Ergonomics Abstracts Analytic* Vol. 8 No. 4, Oct. 1976, 385 pp

ACKNOWLEDGMENT: TRRL (IRRD 225510)

ORDER FROM: Taylor and Francis Limited, P.O. Box 9137, Church Street Station, New York, New York, 10049

07 156892

#### REACTION OF PASSENGERS TO PUBLIC SERVICE VEHICLE RIDE

A series of questionnaire studies is described which was carried out on passengers in public service vehicles in the United Kingdom, particularly cross-channel hovercraft, helicopter and train. The effectiveness of the different rating techniques employed is examined and it is demonstrated that useful and reliable information can be obtained on the effects of such physical parameters as vibration, vehicle motion and noise using rating methods which involve no external standards. Some results obtained from analysis of the survey returns are presented. /Author/ /TRRL/

This paper was presented to the 1975 Ride Quality Symposium, November 1975, pp 437-470.

Clarke, MJ Osborne, DJ *Ergonomics Analytic* Vol. 8 No. 4, Oct. 1976, p 385

ACKNOWLEDGMENT: TRRL (IRRD-225508)

ORDER FROM: ESL

07 157377

#### INFRASOUND IN TRANSPORTATION

Data are presented which show that infrasound up to 120 db levels is encountered in road and rail transportation, and that even higher levels are to be found in ships' engine rooms and in helicopters. The literature of laboratory work on the effects or infrasound provides some rather inconclusive reports of performance deterioration and balance disturbance in the range of intensities reported in vehicles. Evidence is also presented of sensations of euphoria and lethargy. Parallels are drawn between the

lethargy produced by infrasound and rotary motion, and also the similarity between infrasound and high intensity audible noise in impairing relaxation time and vigilance respectively. It is reported that some individuals who report sensitivity to balance disturbance also show an unusual sensitivity to infrasound. In total these effects suggest that infrasound may well have an adverse affect on the performance of drivers. In this respect it probably adds to the already known influences of noise, motion, heat and fatigue, and in this way it may be a factor in some accidents. The magnitude of the role of infrasound in relation to the other factors mentioned is, at the moment, quite impossible to evaluate and further research is clearly needed to decide whether it is significant or entirely trivial. /TRRL/

Tempest, W *Infrasound and Low Frequency Vibration* Monograph 1976, pp 19-46, 13 Fig., 3 Tab., 11 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 224910)  
ORDER FROM: Academic Press Incorporated, 111 Fifth Avenue, New York, New York, 10003

**07 157542**  
**DETERMINATION OF EXPOSURE TO ELECTRIC FIELDS IN EXTRA HIGH VOLTAGE SUBSTATIONS**

It is concluded that the electric field strengths and the electrical discharges to the personnel are the important electrophysical factors. Instruments for measuring the field strength at grounded surfaces and at nonzero potentials were constructed. Results are presented of measurements with these instruments in sub-stations. A dummy was used for the measurement of the distribution of capacitive currents in a man. The dummy can also be used for measuring the effectiveness of special shielding clothes.

Loevstrand, KG *Scandinavian Journal of Work, Environment & Health* Vol. 2 No. 3, 1976, pp 190-198

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Scandinavian Journal of Work, Environment & Health, Haartmaninkatu 1, 00290 Helsinki 29, Finland

**07 158190**  
**PROGRESSIVE TRAINING METHODS IMPROVE THE PERFORMANCE OF OPERATING STAFF**

By introducing modern techniques such as learning objectives and multiple-choice examinations, CFF has greatly increased the efficiency of training programmes used by the Operating Division to prepare recruits for a wide variety of tasks. Special training using video tape to give feedback on teaching performance is given to all instructors who have to take responsibility for training of operating apprentices.

Keller, R *Railway Gazette International* Vol. 133 No. 5, May 1977, pp 195-196, 3 Phot.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

**07 159483**  
**TECHNOLOGY AND WORKING CONDITIONS [Technologie et conditions de travail]**

It is generally agreed that the state of technology determines, among other things, working conditions. But only in few cases is the objective of improving the conditions of workers considered directly during the planning stages of new products and industrial equipment. Using examples of what technical research can contribute toward the solution of this problem, the author attempts to describe the conditions favorable to the development of technology aimed at improving the status of industrial workers. [French]

Bizec, RF *Annales de Mines* Vol. 183 No. 1/2, Jan. 1977, pp 69-74

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

08 139714

**COMPUTATION OF DYNAMIC LOADS AT GRADE CROSSINGS; A USER'S MANUAL OF THE COMPUTER PROGRAM**

This report gives the theoretical background and a description of a computer program, DYMOL, along with its revisions. This program was originally written to calculate the dynamic forces applied normal to a rigid surface by moving traffic. Revisions are made in the program to include the flexibility (stiffness, damping and inertia effect) of the riding surface, and a special subroutine is added to generate typical grade crossing profiles. Input formats, program listing and a glossary of variables are given for the use of the program. Also included with the report are the descriptions of the program's subroutines and functions and method of calculation of dynamic loads along with Maysmeter readings.

Research performed in cooperation with FHWA. See also RRIS 08 131327 7602, HRIS & RRIS 145075 (RRIS 08; Bulletin 7702), and RRIS 08 157501 7702.

Ahmad, A Lytton, RL  
Texas Transportation Institute, (Research Rpt. 164-2) Intrm Rpt.  
TTI-2-18-74-164-2, Jan. 1976, 65 pp, 6 Fig., 2 Tab., 2 Ref., 3 App.

Contract Stdy No. 2-18-74-164

ORDER FROM: NTIS

PB-259673/AS, DOTL NTIS, DOTL RP

08 141701

**ANALYSIS OF CHANGES IN DRIVER REACTION TO IMPROVED WARNING DEVICES AT A RURAL GRADE CROSSING**

The objectives of this research were to analyze the effect on motorists of improving the warning devices at a high-accident, rural grade crossing, from 8-inch flashers to automatic gates and 12-inch flashers activated by a Marquardt speed predictor and have additional strobe lights; to evaluate suitable parameters and to make the analysis; to study accident history and site conditions and relate these to motorist reaction to the system-before and after; and to evaluate the data collection system itself. Spot speeds were taken at eight points on each approach to obtain an approach speed profile for various groups under various conditions after the signal system was improved. These were compared to similar data taken before system improvement. It was shown that an activated gate arm can be as effective in slowing the average approaching vehicle as a train across the road. The strobe lights made the warning system more visible after activation. Most drivers approach a grade crossing safely and mean speed of various groups shows trends but is a relatively weak parameter to test effectiveness, because they do not isolate the occasional, unsafe driver. Percent reduction of fastest cars, along with examining individual "fastest" cars, is a better parameter than mean speeds and deceleration to show improved effectiveness. /Author/

Conducted in cooperation with DOT/FHWA. Research study was titled "A Field Evaluation of Driver Information Systems for Highway/Railway Grade Crossings". Presented at the 55th Annual Meeting of the Transportation Research Board.

Russell, ER (Kansas State University); Michael, HL Butcher, TA  
Purdue and Indiana State Highway Commission JHRP, (C-36-59N) Tech  
Paper JHRP-76-7, Jan. 1976, 36 pp, 6 Fig., 7 Tab., 4 Ref.

ACKNOWLEDGMENT: National Safety Council, Safety Research Info Serv (SRIS 760723 R)

ORDER FROM: Purdue and Indiana State Highway Commission JHRP, Civil Engineering Building, Purdue University, West Lafayette, Indiana, 47907

DOTL RP

08 145075

**DYNAMIC PROPERTIES OF SUBGRADE SOILS, INCLUDING ENVIRONMENTAL EFFECTS**

Three fine-grained soils, varying in clay content between 20% and 70%, were tested in a unique repetitive loading apparatus to determine how soil suction, temperature, and stress state affect resilient modulus and residual strain expected under highway and railroad loadings. In developing equations to predict these dynamic properties, three values of soil suction, stress intensity, and temperature were used in tests of each of the three soils in a statistically designed experiment. A fundamental change in the behavior of the tested

soils from "effectively saturated" to "effectively unsaturated" occurs at a soil suction corresponding to two percent dry of the optimum moisture content. The critical soil suction is directly related to the clay content of the soils. This relation has important implications for the climatic design and stabilization of highway pavements and railroad grade crossings. Equations are developed for the resilient modulus and the residual strain for fine grained soils with clay contents within the range tested. The most important terms in the equations are the number of load cycles and the soil suction, although the other factors that enter into the equations are degree of saturation, volumetric moisture content, volumetric soil content, deviator stress, and mean principal stress. Changes in the dynamic properties due to temperature variations from 72 degrees F (22 degrees C) are determined by a temperature correction factor for which another equation has been developed for each of the two dynamic properties. The powers and the constants of the equation for the resilient modulus temperature correction factor are related to the clay content and the plastic limit of the soil. The powers and the constants of the equation for the residual strain temperature correction factor are related to the clay content and the percent passing the #200 sieve. All of the equations have coefficients of determination above 0.50, which is better than any other published results on these dynamic properties. The equations developed are to help the design engineer to incorporate the resilient modulus, residual strain and climatic conditions into design procedures for highway pavements and railroads, and especially in areas where the dynamic loading is important as, for example, in the case of intersections, railroad grade crossings, and bridge approaches. /Author/

Sponsored by Texas State Department of Highways and Public Transportation and performed in cooperation with DOT, Federal Highway Administration. See also RRIS 08 131327, 7602/76S1, HRIS & RRIS 139714 (RRIS Subject Area 08, Bulletin 7702), and RRIS 08 157501 7702.

Edris, EV, Jr Lytton, RL  
Texas Transportation Institute, (Research Rpt. 164-3) Intrm Rpt.  
TTI-2-18-74-164-3, May 1976, 157 pp, 73 Fig., 11 Tab., 41 Ref., 5 App.

Contract Study No. 2-18-74-16 (4)

ORDER FROM: NTIS

DOTL NTIS, DOTL RP

08 146560

**RAILROAD CROSSING SIGNALLING SYSTEM**

Disclosed is a highway-railroad crossing signalling system utilizing microwave telemetry to convey control information from a remote sensing location to a receiver coupled to an active motorist warning device.

This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of patent available Commissioner of Patents, Washington, D.C. 20231.

Hopkins, JB  
Department of Transportation Patent PAT-APPL-184-828, No Date

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PATENT-3758775, DOTL NTIS

08 147064

**RAILROAD/HIGHWAY ACCIDENT REPORT, COLLISION OF A BALTIMORE AND OHIO FREIGHT TRAIN WITH A PICKUP TRUCK, BECKEMEYER, ILLINOIS, FEBRUARY 7, 1976**

At 6:50 p.m., c.s.t., on February 7, 1976, a westbound Baltimore and Ohio freight train struck a pickup truck at an unprotected grade crossing in Beckemeyer, Illinois, when the pickup truck proceeded across the crossing without stopping. Of the 16 persons in the truck, 12 were killed and 3 were injured. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the truckdriver to perceive the approaching train and to stop his vehicle short of the tracks. The lack of active grade crossing signals at the crossing probably contributed to his failure to perceive the train.

National Transportation Safety Board NTSB-RHR-76-3, Aug. 1976, 13 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-258255/9ST, DOTL NTIS

08 149944

**ACCIDENTS ON LEVEL CROSSINGS 1975 [Ongevallen op overwegen 1975]**

Statistical data of accidents on level crossings are given for 1975 including collisions between the train and vehicles as well as pedestrians. Comparisons are made with data from previous years, and accidents which occurred on protected crossings are differentiated from those occurring on semi-protected or unprotected crossings. /TRRL/ [Dutch]

Vanakman, HWF Mossink, AC  
Nederlandse Spoorwegen, Dienst van Infrastructuur Aug. 1976, 14 pp, Tabs.

ACKNOWLEDGMENT: Institute for Road Safety Research (SWOV60020E), TRRL (IRR 224130)

ORDER FROM: Nederlandse Spoorwegen, Dienst van Infrastructuur, 1 Moreelsepark, Utrecht, Netherlands

08 152404

**AUTOMATIC BARRIERS CONTROLLED FROM THE TRAIN [Die zuggesteuerten Schranken]**

The author describes experimental barrier installations controlled from the train on the DB. The process in the danger area is set in motion by laser beams or electromagnetic waves. The author also quotes other examples to illustrate the range of possibilities that exist for using automatic half-barriers. [German]

Schuessler, W *Signal und Draht* Vol. 68 No. 10, Oct. 1976, pp 207-214, 3 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Dr Arthur Tetzlaff-Verlag, Niddastrasse 64, Frankfurt am Main, West Germany

08 152457

**INVESTIGATIONS OF RAILROAD-HIGHWAY GRADE CROSSING ACCIDENT DATA**

This research resulted in improved techniques for predicting railroad-highway grade crossing accidents and their severity. Although many variables could not be investigated in the study, the capability for their subsequent consideration has been established. A framework for using accident prediction equations has been outlined and may be expanded as additional factors relating to safety improvements are investigated. There are still many unanswered questions regarding the occurrence of accidents and their severity at grade crossings. In this study, the ratio of the number of accidents for a group of crossings to the number of crossing years of exposure has evolved as a measure of the accident potential for a group of crossings. Future studies based on the Nationwide DOT-AAR grade crossing inventory and the revised FRA accident information will be helpful in establishing many other useful relationships between crossing characteristics and accident potential.

This paper was announced in Vol. 78, No. 660 (Nov.-Dec. 1976) of the AREA Bulletin, pp 241-242.

Coleman, J Stewart, GR  
Federal Highway Administration Apr. 1976

ACKNOWLEDGMENT: AREA Bulletin  
ORDER FROM: ESL

DOTL JC

08 152459

**PASSIVE CONTROL AT RAIL-HIGHWAY GRADE CROSSINGS**

Passive signing for grade crossing warning initially involved development of field techniques to measure the effectiveness of such devices. After measures of effectiveness were developed, two combinations of advance signs and crossbucks were chosen for evaluation. The second phase of this project involved statistical tests, site selection and preliminary evaluation of the sites. The third phase of the project focused on the "after" study and the analysis of "before" and "after" data. The reaction of motorists is discussed.

This report was announced in Vol. 78, No. 660 (Nov.-Dec. 1976) of the AREA Bulletin, pp 240-241.

Dommasch, IN Hollinger, RL Reilly, EF  
New Jersey Department of Transportation Dec. 1975

ACKNOWLEDGMENT: AREA Bulletin  
ORDER FROM: ESL

DOTL JC

08 152460

**SELECTIVE CROSSING CLOSURES-A NEGLECTED OPTION IN CROSSING SAFETY PROGRAMS**

The cost of grade crossing warning devices and changes in urban traffic patterns make the closing of one or more adjacent crossings practical when a crossing is provided with automatic protection. In considering closure, it is necessary to make a thorough study of the public service provided by the facility which should include the general area served by the crossing; the role of the street in the traffic pattern of the area; growth trends in the affected area; availability of alternative routes along with origin-destination studies of traffic now using the crossing; through and switching moves of trains, including total blockage time; cost/benefit analysis of the crossing; and role of the crossing in serving emergency needs such as fire, police and ambulance use.

This paper, presented at a 1976 Traffic Conference, was announced in Vol. 78, No. 660 (Nov.-Dec. 1976) of the AREA Bulletin, pp 245-246.

Astle, DJ  
Oregon Public Utilities Commission Conf Paper 1976

ACKNOWLEDGMENT: AREA Bulletin  
ORDER FROM: ESL

DOTL JC

08 153966

**RAILROAD GRADE CROSSING PASSIVE SIGNING STUDY**

More than three-fourths of the 219,000 public railroad grade crossings nationwide are equipped with passive warning signs only. A two-phase study is now underway to develop improved passive signing for use at these grade crossings. This study is a pool-funded effort involving 25 states, the Federal Railroad Administration and the Federal Highway Administration. This report describes seven signing configurations (at-crossing sign and advance warning signs) tested in two states during Phase I of the study, the test sites, the types of data collected, the experimental variables, the analysis procedure, and the results of Phase I. Upon completion of Phase II, which involves nationwide testing, a final report will be written making recommendations on what signs should be adopted for driver warning at railroad grade crossings.

Sponsored in part by Federal Highway Administration, Washington, D.C. Office of Research.

Koziol, JS Mengert, PH  
Transportation Systems Center, Federal Highway Administration Intrm Rpt. DOT-TSC-FHWA-76-1, Jan. 1977, 137 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264769/3ST, DOTL NTIS

08 154800

**POTENTIAL MEANS OF COST REDUCTION IN GRADE CROSSING AUTOMATIC GATE SYSTEMS. VOLUME I: OVERVIEW AND LOW COST RAILROAD/HIGHWAY GRADE CROSSING GATE SYSTEMS**

This report, Volume I of a two-volume study, examines the potential for reduction of the cost of installing and maintaining automatic gates at railroad-highway grade crossings. It comprises a general overview; a review of current practices, equipment, and standards; a consideration of modification of existing specifications to permit use of alternative technologies; the generation of design concepts for new gate systems or subsystems intended to offer significant economic benefits; an analysis and comparative evaluation of the more promising concepts; and conclusions concerning further design, development, and test activities. Concepts found to be particularly promising include a low-cost gate-drive mechanism utilizing high-reliability commercially available components; a swing-away, gravity resetting arm support intended to reduce the incidence of gate breakage; and a gate arm using new materials to obtain resistance to breakage.

See also PB-265 725.

St. Amant, A  
MB Associates, Federal Railroad Administration, Transportation Systems Center Final Rpt. FRA/ORD-77/067.I, Feb. 1977, 90p



Contract DOT-TSC-859  
 ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

ORDER FROM: ESL

DOTL JC

PB-265724/5ST, DOTL NTIS

**08 154801**  
**POTENTIAL MEANS OF COST REDUCTION IN GRADE CROSSING AUTOMATIC GATE SYSTEMS. VOLUME II. IMPROVED GATE ARM CONCEPTS FOR RAILROAD/HIGHWAY GRADE CROSSINGS**

This report, Volume II of a two-volume study, examines the potential for reduction of the cost of installing and maintaining automatic gates at railroad-highway grade crossings. It includes a review of current practices, equipment, and standards; consideration of modification of existing specifications to permit use of alternative technologies; generation of design concepts for new gate systems or subsystems intended to offer significant economic benefits; analysis and comparative evaluation of the more promising concepts; and conclusions concerning further design, development, and test activities. Concepts found to be particularly promising include a pneumatic gate-drive mechanism and a swing-away, gravity-resetting arm support intended to reduce the incidence of gate breakage; and a gate arm using new materials to obtain resistance to breakage.

See also PB-265 724.

Duttera, J Friedland, M  
 MB Associates, Federal Railroad Administration, Transportation Systems Center Final Rpt. Feb. 1977, 66p

Contract DOT-TSC-858

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-265725 2ST, DOTL NTIS

**08 156867**  
**IMPROVEMENT OF THE EFFECTIVENESS OF MOTORIST WARNINGS AT RAILROAD-HIGHWAY GRADE CROSSING**

Flashing red incandescent lamps have formed the primary motorist warning device at grade crossings for several decades, in spite of technical constraints that inherently limit the overall effectiveness possible. Tightly focused beams, necessary to obtain high intensity at low power consumption, make perceived brightness highly dependent on precise alignment, which is difficult to achieve and expensive to maintain. In this report an examination of appropriate literature and existing standards reveals preliminary requirements of function and desirable qualities for such motorist warnings. A consideration of relevant lighting technology shows that significant improvement is possible through the use of xenon flashlamps in standard crossing mountings. The quiet flash of the xenon unit appears to be more effective, with little deviation from the applicable standards, what motorists are used to, and conventional equipment. This study includes a discussion of optimal specifications, relevant technology, field tests, and related topics including system credibility and the use of highway traffic signals.

Sponsored by the FRA/U.S. DOT.

Hopkins, JB White, E  
 Transportation Systems Center, (DOT-TSC-FRA-76-25) Final Rpt. FRA/ORD-77/07, Feb. 1977, 96 pp, 34 Fig., 2 Tab., 31 Ref.

ACKNOWLEDGMENT: FRA  
 ORDER FROM: NTIS

PB-266784/AS, DOTL NTIS, DOTL RP

**08 156914**  
**FEDERAL FUNDING IS BEGINNING TO PAY OFF**

Grade crossing separations, protective devices and improved surfaces can all be funded under the Federal Highway Safety Act of 1973 and continued under the Highway Act of 1976. Cooperative efforts by federal, state and local government agencies working with railroads are paying off in an area where railroads formerly were expected to carry virtually the entire protection burden. Accidents and fatalities are dropping. Spending for crossing surfaces has sparked development of new types. Problems with certain funding at national and state levels continue to impede certain projects. The activities of Boston and Maine Railroad working with governments in its region are described.

Dick, MH *Railway Age* Vol. 178 No. 9, May 1977, pp 39-42, 1 Phot.

**08 157241**  
**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 are given.

Herbert, AJ Smith, NMH *Australian Road Research* Vol. 6 No. 3, Sept. 1976

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

**08 157501**  
**AN ANALYSIS AND DESIGN PROCEDURE FOR HIGHWAY-RAILROAD GRADE CROSSING FOUNDATIONS**

Both highway and railroad organizations are concerned with the maintenance problems of highway-railroad grade crossings. The Texas State Department of Highways and Public Transportation spends approximately one-half million dollars yearly for the maintenance of grade crossings. It has been the usual experience of engineers and it is a conviction implicit in this study that a major portion of such maintenance costs may be reduced by an improved knowledge of actual behavior of a railroad track under both railway and highway traffic and the influence of environmental factors. Up to the present time, no rational approach to analysis and design of a grade crossing structure has been available. In this study a design system for a grade crossing is developed. A unique design criterion of permanent differential deformation between railroad track and adjacent highway pavements is established. This criterion is related to other existing criteria, available in pavement design literature, which are related to the rideability. Polynomial stress equations are developed separately for railroad and highway pavement under their typical design wheel loads to predict stresses at different depths. Characteristic properties of all materials involved, such as resilient modulus and permanent deformation under repeated loading are considered. The influence of environmental factors such as temperature and moisture balance on subgrade material characteristics is also included. A computer program is developed to calculate the differential deformation (the design criterion) for the purpose of the design of a grade crossing. The concept of differential deformation as a design criterion and the design system proposed in this report constitutes a new and rational approach to the design of highway and railroad grade crossings. Several example problems are presented to illustrate the whole design system. These examples also illustrate how these designs must change according to the variations in expected loading, temperature, climatic zone, and subgrade soil.

Research sponsored by the Texas State Department of Highways and Public Transportation and performed in cooperation with the FHWA, U.S. DOT. See also RRIS 08 131327 7602, HRIS & RRIS 139714 (RRIS 08, 7702), HRIS & RRIS 145075 (RRIS 08; Bulletins 7702).

Ahmad, A Lytton, RL Olson, RM  
 Texas Transportation Institute, (Res. Rpt. 164-4F) Final Rpt. TTI-2-18-74-164-4F, Nov. 1976, 104 pp

ACKNOWLEDGMENT: Texas Transportation Institute  
 ORDER FROM: NTIS

DOTL NTIS, DOTL RP

**08 158184**  
**COLLECTION OF EXAMPLES OF STRUCTURES FOR REMOVING THE NEED FOR LEVEL CROSSINGS**

[Musterkollektion von Bauwerken zur Beseitigung von Bahnhuebergaengen]  
 No Abstract. [German]

Pfeifer, R *Die Bundesbahn* Vol. 52 No. 12, Dec. 1976, pp 821-826, 5 Fig., 4 Tab., 13 Ref.

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

08 159472

**BEWARE OF THE TRAIN. COLLISIONS BETWEEN ROAD AND RAILWAY VEHICLES [Varning foer Taag. Kollisioner mellan vaeg-och jernvaegsfordon]**

In a year there are about 60 level crossing collisions involving personal injuries. The mortality among the road users is at least seven times higher than in other road accidents with personal injuries. A purpose of the investigation was to get useful knowledge of how and why the collisions occur. Other purposes were to form a better basis of evaluating safety promotion measures for level crossings. The factors investigated were traffic flows in open and guarded level crossings with light and aural signals, sight distances at open level crossings with crossed marker posts, the administration of justice after collisions and how the state subsidy for level crossing traffic safety measures is used. /TRRL/ [Swedish]

Thorson, J

Umeaa University, Sweden Monog Rpt. 1976, 64 pp, 1 Fig., Tabs., 11 Phot., Refs.

ACKNOWLEDGMENT: TRRL (IRRD-225871), National Swedish Road & Traffic Research Institute

ORDER FROM: Umeaa University, Sweden, Hygieniska Institutionen, Umeaa, Sweden

09 143290

**ACCESS 1: APPROXIMATION CONCEPTS CODE FOR EFFICIENT STRUCTURAL SYNTHESIS PROGRAM DOCUMENTATION AND USER'S GUIDE**

The program documentation and user's guide for the ACCESS-1 computer program is presented. ACCESS-1 is a research oriented program which implements a collection of approximation concepts to achieve excellent efficiency in structural synthesis. The finite element method is used for structural analysis and general mathematical programming algorithms are applied in the design optimization procedure. Implementation of the computer program, preparation of input data and basic program structure are described, and three illustrative examples are given. (Author)

Miura, H Schmit, LAJ  
California University, Los Angeles NASA-CR-144905, May 1976, 94 pp

Contract NGR-05-007-337

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

DOTL NTIS

09 148605

**FLEXIBLE FOAM PLASTICS: TECHNICAL FILE NO. 35**

Several types of flexible foam plastics are available in a variety of grades. The author offers advice to designers on making the right choice.

Harris, N *Engineering* Vol. 216 No. 11, Nov. 1976, 4 pp, 6 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

09 148618

**LABORATORY PERFORMANCE OF RAILROAD BALLAST**

Vibration, one-dimensional repeated loading and standard triaxial test results on a railroad ballast are presented. The vibration tests were performed in an oedometer using independently variable vertical amplitudes, frequencies and surcharge pressures. The repeated load tests were also performed in an oedometer to study the influence of initial density, loading intensity and ballast grading. The main properties obtained from the above tests are the vibration characteristics, strength, stress-strain characteristics, density and disintegration of the ballast.

Presented at the 2nd Australia-New Zealand Conference of Geomechanics in Brisbane, Australia, July 21-25, 1975.

Raymond, GP (Queen's University, Canada); Gaskin, PN Davies, JR Van Dalen, K Svec, O *Institution of Engineers (Australia) Natl Conf Pub Conf Paper* No. 75/4, 1975, pp 238-242, 12 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Institution of Engineers (Australia), Science House, Gloucester and Essex Streets, Sydney, Australia

09 148622

**APPLICATIONS OF FRACTURE MECHANICS IN FAILURE PREVENTION**

Linear Elastic Fracture Mechanics (LEFM or simply "fracture mechanics") provides an analytical framework for assessing the influence of sharp defects on the load-bearing capability of a structure. Starting with a simple equation which relates applied stress and crack size, the influence of the material's thickness and yield strength can be calculated. Thus the size of defect which will cause failure under the applied stress may be determined. Armed with this information, the metallurgist can assess the safety of a structure from the viewpoints of non-destructive testing standards, construction standards, and conditions of operation throughout its service life. A basic treatment of fracture mechanics precedes a short discussion of its application to failure prevention. Two examples illustrate the approach.

Langford, WJ (Chalk River Nuclear Laboratory, Canada)  
Atomic Energy of Canada Limited AECL No. 5506, May 1976, 21 pp, 12 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Atomic Energy of Canada Limited, 275 Slater Street, Ottawa, Ontario K1A 0S4, Canada

09 149958

**ASPECTS OF OCCUPATIONAL MEDICINE IN CONNECTION WITH THE USE OF WEED-KILLERS ON THE RAILWAYS**

[Arbeitsmedizinische Aspekte fuer die betriebliche Anwendung von Herbiziden bei den Eisenbahnen]

No Abstract. [German]

Groesz, HR *Verkehrsmedizin und Ihre Grenzgebiete* Vol. 23 No. 8/9, Aug. 1976, pp 321-325, 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Transpress VEB Verlag fuer Verkehrswesen, Franzoesische Strasse 13-14, 108 Berlin, East Germany

09 149991

**RAPID CALCULATION OF STRESS INTENSITY FACTORS**

A method for computing stress intensity factors for cracks embedded in structural details is described. It consists of adding to accepted solutions for cracks in finite plates and bodies of uniform contour a geometry correction factor which accounts for the stress gradient produced by the geometric discontinuity of the detail. This correction factor is determined by integrating away the stresses normal to the line where the crack is to be inserted. The method is applied to the case of a crack emanating from a circular hole in a plate, and the results are found to be in good agreement with Bowie's numerical solution. Values of the stress intensity factor for cracks emanating from spherical weld porosities, and part-through cracks at stiffeners and cover plate ends are computed.

Albrecht, P Yamada, K *ASCE Journal of the Structural Division* Vol. 103 No. ST2, Proc. Paper 12742, Feb. 1977, pp 377-389

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

09 152680

**FINITE ELEMENT STRESS ANALYSIS**

The finite element method of stress analysis can produce solutions to complex stress analysis problems with reasonable expenditure of time and resources. With its mathematic foundation well established, current research efforts concentrate on refining existing techniques and developing new special-purpose elements.

Based on SAE paper 770605, "Finite Element Method in Stress Analysis Practice", by E. Citipitioglu, V.T. Nicolas, and S.K. Tolani, Structural Dynamics Research Corporation. Presented at the Vehicle Structural Mechanics Conference, Southfield, Michigan, 18-20 April, 1977.

*Automotive Engineering* Vol. 85 No. 4, Apr. 1977, pp 44-48, 3 Fig., 1 Tab., 2 Ref.

ORDER FROM: ESL

09 153399

**STRAIN GAUGES**

A series of articles on Basic principles, types and instrumentation; Performance monitoring, by E. Chamberlain and P. Brown; Strain gauge transducers, by A.L. Knight; and Strain gauge techniques, including work done by BR's R&D Division's Dynamics Group.

Window, AL *Engineering Material and Design* Vol. 21 No. 2, Feb. 1977, pp 45-62

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

09 153400

**ANALYSIS OF STRUCTURAL FAILURES**

In Part 1 a classification of basic types of structural failure is presented. This classification is expanded into a set of parameter statements which could be assessed subjectively in a prediction process. This process is intended to account for a structure failing due to causes other than stochastic variations in load and strength. The parameters are assessed for 23 major structural accidents and one existing structure and are analysed using a simple numerical interpretation. The accidents are ranked in their order of inevitability. Human errors of one form or another proved to be the dominant reasons for the failures considered. A simplified form of the

proposed procedure for predicting the likelihood of structural accidents is outlined in Part II. This is then applied to the 24 accident parameter assessments made in Part I. The concept of fuzzy sets is used.

Blockley, DI *Institution of Civil Engineers, Proceedings* Vol. 62 Feb. 1977, pp 51-74

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

09 153401

**CORROSION RESISTANT COATINGS FOR STEEL**

This article is concerned with inorganic anticorrosion coatings which are available for steels. The more commonly encountered processes are discussed first but more sophisticated techniques are described as well.

Archer, NJ Archibald, LC *Chartered Mechanical Engineer* Vol. 24 No. 2, Feb. 1977, pp 59-63

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

09 153402

**GLASS FIBRE REINFORCED CEMENT: A NEW MATERIAL FOR CONSTRUCTION AND ENGINEERING**

Cement based products, particularly concrete and reinforced concrete, have long been accepted as falling within the realm of the civil engineer. However, with the advent of Glass-Fibre Reinforced Cement (GRC), traditional demarcations must be reconsidered and a cement based material may perhaps be considered to intrude into the realms not only of material scientists, but also of mechanical engineers. GRC gives a whole family of materials with useful mechanical properties which may be used as readily available substitutes for other materials. It has implications of general interest to engineers and it is hoped that this article will serve to stimulate that interest further by outlining some of the properties, production methods, design and application problems associated with GRC development to date.

Blackman, LCF *Chartered Mechanical Engineer* Vol. 24 No. 1, Jan. 1977, pp 45-51

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

09 154110

**CHEMICAL TREATMENT AND PRESERVATION OF WOOD**

Contents: Method for the production of plasticized wood; Determination of the diffusion coefficient of bound water in wood; Hydrolysis of birch wood in vibrating mill M-10 in the presence of different catalysts; Hydrolysis of lignocellulose with sulfuric acid concentrated directly within the material; Influence of salts of different compositions on the dissolution of lignin and carbohydrates of deciduous species during aqueous and hydrotropic digestions; Dissociation of carbohydrates and formation of furfural under conditions of hydrotropic digestion of deciduous wood; Measurement of oxidation potential as a method of study, control, and automation of the bleaching of cellulose; Oxidative decomposition of demethylated lignosulfonic acids; Thermal decomposition of hydrolytic lignin in a current of noncondensable gases in an internally heated retort; Variations in the physical-chemical properties of wood charcoal on roasting; Study of activated charcoals from lignin; Review of work done on lignin distribution in the cell wall of wood; Forty years of wood preservation; Investigations on wood protection carried out at the Institute of Forestry and Wood Chemistry; Prospects of utilizing arsenin-containing preparations for wood protection in USSR; Study of the influence of nutrient media and vitamins on the wood-decomposing activity of *Coniophora cerebella*; Testing the fungicidal properties of maleic hydrazide; Prospects of artificial resinification of sapwood of young pine stumps; Study of the efficiency of tapping pine trees with the chemical effect of sulfuric acid by the combined ascending method of Paul Rasinsch; Flowability of pressed articles made of ground wood; Effect of some factors on the time taken for pressing chipboards by the method of wetting the outer layers; Prospects of convectional drying of timber in vacuum and at high-pressures; Some results of a study of the process of separating wood green by drum separator.

Trans. of mono. Khimicheskaya Pererabotka i Zashchita Drevesiny, n.p.,

n.d. Sponsored in part by National Science Foundation, Washington, D.C. Special Foreign Currency Science Information Program.

Gromov, VS  
Department of Agriculture, National Science Foundation TT-70-57102,  
1976, 342 pp

Contract NSF-C466

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263975-T/ST, DOTL NTIS

09 156211

**OBSERVATIONS OF FIBROUS FRACTURE MODES IN A PRESTRAINED LOW-ALLOY STEEL**

Crack-opening displacement (COD) tests have been performed on prestrained QIN (HY-80) low-alloy steel. In specimens containing fatigue precracks the COD is largely insensitive to prestrains below 0.17, but a significant reduction in COD occurs at higher prestrains. Measurements of the yield-stress variation with tensile strain have enabled the effects of prestrain on fracture toughness to be estimated. Apart from a small initial increase, the general effect of prestrain is to reduce fracture toughness. The decrease in toughness with prestrain is accompanied by the development of zig-zag fractures. Crack growth appears to be intermittent and occurs by a process of shear decohesion along paths corresponding to either the spiral slip-lines emanating from a blunted crack-tip, or, at lower displacements, the straight slip-lines emanating from a sharp crack.

Clayton, JQ (Cambridge University, England); Knott, JF *Metal Science*  
Vol. 10 No. 2, Feb. 1976, pp 63-71, 17 Ref.

ACKNOWLEDGMENT: EI (EIX770400373)  
ORDER FROM: ESL

09 156319

**ASPECTS OF SUSCEPTIBILITY OF WELDED STEEL STRUCTURES TO BRITTLE FRACTURE [Synpunkter på sprödbrottskanslighet i svetsade stålkonstruktioner]**

The phenomenon of brittle fracture occurring in welded joints of welded steel structures is examined. Detailed attention is given to the mechanism of crack initiation and propagation in welds, susceptibility of welded and stress-relieved steel structures, and brittle fracture with estimation. [Swedish]

Soininen, R *Svetsen*

ACKNOWLEDGMENT: EI (EIX770400544)  
ORDER FROM: ESL

09 156905

**TRENDS IN INSULATION**

Dielectric pastes compatible with both precious and base metal conductors are introduced. Substitutions such as polyphenyl sulfide for mica and aramid fibers, fiber glass, and polyethylene terephthalate for asbestos are discussed.

*Insulation/Circuits* Vol. 23 No. 1, Jan. 1977

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 156911

**PULSE COMPRESSION TECHNIQUES IN ULTRASONIC NON-DESTRUCTIVE TESTING**

The development of a pulse compression system applicable to ultrasonic flaw detection is described. The use of pulse compression technique permits a pulse-echo detection system to operate with long transmitted pulses for increased sensitivity, but without sacrificing resolution. The described system is economically implemented using an aluminium strip dispersive delay line. The operating system achieves a time-bandwidth product of 84 and sidelobe levels of -25 dB. Experimental evidence of the system's capabilities is presented.

Lam, F (Hong Kong University, Hong Kong); Szilard, J *Ultrasonics*  
Vol. 14 No. 3, May 1976, pp 111-114, 6 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

09 157521

**PARAMETERS INFLUENCING RESISTANCE TO WEAR OF TWO STEEL SURFACES IN THE CASE OF ABRASION BY GRANULAR MINERAL MATTER BETWEEN THEM**  
 [Einflussgrößen auf das Gleitverschleissverhalten von stahlpaarungen unter Wirkung Koerner mineralischer Zwischenstoffe]  
 No Abstract. [German]

Pigors, O *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 23 No. 4/5, 1976, pp 875-883, 11 Fig., 1 Tab., 3 Phot., 6 Ref.

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

09 157545

**EVALUATION OF CHROME COLUMBIUM ALLOY RAIL PRODUCED BY THE SYDNEY STEEL CORPORATION**  
 Mechanical tests, macro and micrographic investigations on these rails, which are superior to standard rails in terms of resistance to scaling, traction, ductility, hardness, and gradual flexion, but rather inferior where resilience is concerned, are described.

*AREA Bulletin* No. 661, Jan. 1977, pp 448-474, 6 Fig., 7 Tab., 14 Phot.

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

DOTL JC

09 157582

**FATIGUE FROM NOTCHES IN CAST STEELS**  
 A range of plain carbon, carbon and manganese, and low-alloy cast steels have been tested in fatigue in bending with notches of radii from 0.125 to 25.4 mm. The number of cycles to produce a detectable fatigue crack correlated well with the range of stress-intensity factor divided by the square root of the notch-root radius, providing an adequate engineering method for design. Fatigue-crack propagation rates were also measured. Fatigue-crack propagation is anomalously high for fatigue cracks of 1.0 mm or less emanating from notches. This is thought to arise because of rapid fatigue propagation through the region of the Neuber particle.

Barnby, JT (Aston University, England); Holder, R *Metal Science* Vol. 11 No. 1, Jan. 1977, pp 5-10, 14 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

09 157583

**FATIGUE FROM CAST-TO-SHAPE NOTCHES IN STEELS**  
 Previous work has reported on initiation and propagation of fatigue cracks from machined notches in cast steels. That work is extended here to notches of 12.5 and 25.4 mm radii with sand-cast surfaces. The comparison of initiation lives of machined and cast notches allows calculation of the effective notch radius arising from the cast surfaces. This effective radius is, in all cases, significantly less than the macroscopic notch radius and is a practical and important factor in the design of steel castings facing fatigue service conditions.

Holder, R (Aston University, England); Barnby, JT *Metal Science* Vol. 11 No. 1, Jan. 1977, pp 11-15, 6 Ref.

ACKNOWLEDGMENT: EI  
 ORDER FROM: ESL

09 157593

**DYNAMICS OF STRUCTURES**  
 This textbook covers a broad range of dynamic analyses required in structural design. The time-varying response of structures due to time-varying loadings is expanded from single-degree of freedom systems to generalized single-degree systems to the mode-superposition analysis of multidegree discrete-coordinate structures. It also considers the analysis of vibration mode shapes and frequencies, the response of structures of

arbitrary periodic and nonperiodic loadings, as well as both linear and nonlinear systems. Solutions are oriented toward use of digital computers. Although the frame of reference is civil engineering applications, the techniques are applicable to mechanical structures subjected to time-varying loadings.

Reviewed in ASME Transactions, June 1977, p 366.

Clough, RW Penzien, J  
 McGraw-Hill Book Company, Incorporated Monograph 1975, 635 pp

ACKNOWLEDGMENT: ASME Transactions  
 ORDER FROM: McGraw-Hill Book Company, Incorporated, 1221 Avenue of the Americas, New York, New York, 10020

09 157694

**A COMPARATIVE STUDY OF PHYSICAL PROPERTIES OF VARIOUS TYPES OF WOOD USED IN RAILROAD CROSSTIES**  
 A comparative evaluation of the physical properties of pine, red oak and white oak crossties. Rail seal positive bending and tie center positive-negative bending moment tests were performed. Additionally, tie plate cutting and spike holding power were determined through tests performed on Tie Wear machines.

Knoblock, OW  
 Association of American Railroads Technical Center, (Project W502) Test Rpt. R-255-A, July 1977, 32 pp, 23 Fig., 1 Tab., 1 App.

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

DOTL RP

09 157708

**INTERNAL AND STRAIGHTENING STRESSES IN NEW-ROLLED RAILS**

When laying a rail in the track it must be assumed that in general with given static/dynamic cases of loading, the fatigue strength of the rail material is affected more or less by the thermal and internal stresses. Whereas with thermal stress a technical solution is possible only by laying the rail at a mean temperature between summer and winter, the results of internal stress measurements in rails of different quality and section show that by suitable choice of section and material a reduction can be achieved in the tensile internal stresses in the longitudinal flange direction, and in the compressive internal stresses in the longitudinal head direction, and hence better utilization of the material in respect of its fatigue strength. The results show in detail that internal stresses in new-rolled rails are caused mainly during straightening and not during cooling, and also as a result of the associated phase change. Their magnitude and distribution over the cross-section depend on the curvature of the rail before strengthening, on the yielding point of the material, and on the rail section. Comparison between measured and calculated internal stress shows that the internal stresses caused by strengthening result not only from plastic, pure bending of the rail in the strengthening press, but also from the plastic, deformation of the rail in way of the contact points of the strengthening rolls. [German]

Asbeck, HO Heyder, M *Eisenbahntechnische Rundschau* Vol. 26 No. 4, Apr. 1977, 5 pp

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

DOTL JC

09 157952

**TECHNOLOGY TRANSFER--TRANSPORTATION**

The Technology Utilization Program of the National Aeronautics and Space Administration aims to transfer space-related technology to the solution of nonspace problems. One of the areas is transportation. Members of SRI Technology Applications Team routinely work with a user community comprising, among others, DOT and the railroads. Rail industry needs addressed by the team included: the need for early warning of impending roller bearing failure; detection of residual stresses in wheels and rails; dynamic relationships between cars and track; quieting of diesel locomotive exhaust; fire-resistant construction materials and improved management techniques (for the rapid-transit industry).

Anyos, T Brown, I Lizak, R Loomis, A Wilhelm, J  
Stanford Research Institute Biann Rpt. SRI-PYU-3670, Apr. 1977, 211  
pp, Figs., Tabs., 6 Ref., 5 App.

Contract NAS-2-9318

ACKNOWLEDGMENT: Stanford Research Institute

ORDER FROM: Stanford Research Institute, 333 Ravenswood Avenue,  
Menlo Park, California, 94025

DOTL RP

10 053205

**SHINKANSEN NOISE**

This Technical Document summarizes the tests made by Japanese National Railways, up to 1973, for the abatement of noise and vibrations on vehicles and railway structures on their Shinkansen high speed line. Having dealt with the different noise sources and the special characteristics of railway noise, the factors chiefly affecting the noise level are discussed. Finally, the measures adopted to reduce noise on vehicles and tracks are described, such as wheels provided with vibration damping, sound skirting on vehicles, different types of noise barrier construction, rails provided with vibration damping, ballast mats and covering of steel bridges.

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

International Union of Railways DT52/E, June 1976, 97 pp, Figs., 7 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

10 093363

**VIBRATION PREDICTION MODEL FOR FLOATING-SLAB RAIL TRANSIT TRACK**

This report presents the theoretical development of a model to predict the vibration reduction by floating-slab tracks in subway tunnels. Data from a field study in New York City are also presented. The report is one of three reports dealing with noise and vibration control for urban rail transit track and elevated structures. The theoretical model described allows for the prediction of the force transmissibility--the ratio of the amplitudes of the force on the tunnel floor and the force on the rail. Data from the field study support the use of a simple single-degree-of-freedom oscillator for predicting vibration reduction. The theoretical model developed allows predictions to be made for a more general case.

Manning, JE Hyland, DC Tocci, G  
Cambridge Collaborative, Urban Mass Transportation Administration,  
Transportation Systems Center Final Rpt. UMTA-MA-06-0025-7513,  
DOT-TSC-UMTA-75-17, Aug. 1975, 142 pp

Contract DOT-TSC-643

ACKNOWLEDGMENT: NTIS, UMTA  
ORDER FROM: NTIS, Repr. PC, Microfiche  
PB-245638/2ST, DOTL NTIS

10 143929

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY (MBTA) RAPID TRANSIT SYSTEM (RED LINE) WAYSIDE AND IN-CAR NOISE AND VIBRATION LEVEL MEASUREMENTS**

Wayside and in-car noise and vibration characteristics of a late-model mass transit car making up 2-car and 4-car trains are tabulated and analyzed in this report. The MBTA Type 1 South Shore Rapid Transit Car, designed and built by Pullman Standard, Chicago, Illinois and currently in operation on the Red Line of the Massachusetts Bay Transportation Authority (MBTA) was measured. Wayside measurements had been made by the tracks of the South Shore Extension of the Red Line 58 days after the official September 1, 1971 opening of this extension. These wayside measurements were repeated six months later. In-car noise and vibration measurements are made in a selected 2-car train on a typical run over various sections of the Red Line.

Rickley, EJ Quinn, RW  
Transportation Systems Center, Office of the Secretary of Transportation  
Final Rpt. DOT-TSC-OST-72-31-, Aug. 1972, 223 pp

Contract DOT-OS-207

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257127/1ST, DOTL NTIS

10 148810

**ENVIRONMENTAL ASSESSMENT NOTEBOOK SERIES**

Topics in the series are: v. 1 Identification of transportation alternatives, v. 2 Social impacts, v. 3. Economic impacts, v. 4. Physical impacts, v. 5. Organization and content of environmental assessment materials, v. 6. Environmental assessment reference book, (v.7) Summary.

This series of documents consists of 7 volumes and was sponsored by the

DOT.

Skidmore, Owings and Merrill, Department of Transportation,  
(DPT-P-6500.4) TD 1.8:En 8/Transp., 1975, Figs., Refs.

Contract DOT-OS-40175

ACKNOWLEDGMENT: Monthly Catalog of Us Government Publications  
(76-7132)  
ORDER FROM: GPO

S/N 050-000-00109-1

10 149381

**REDUCING THE NOISE NUISANCE OF JAW-TYPE RETARDERS**

Noise nuisance can occur at marshalling yards where jaw-type retarders are employed, although the noise produced is less with secondary retarders than with retarders in the reception lines. The noise problem of secondary retarders has been overcome by the measures described in the article. Investigations were therefore carried out at the hump installation of the DB's marshalling yard at Duisburg-Hochfeld-Sud to examine how far the solution for secondary retarders can be applied to those in reception tracks. Loud screeching and grating noises of long duration occur particularly at reception-track retarders, and are a source of Technology now in progress, but preliminary results are already given here. [German]

Kepper, H Meuters, G *Eisenbahntechnische Rundschau* Vol. 25 No. 10,  
Oct. 1976, pp 606-608

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

DOTL JC

10 149382

**NOISE ABATEMENT ON THE RAILWAYS AS A CONTRIBUTION TO ENVIRONMENTAL PROTECTION**

More and more vehicles are penetrating to even the most remote places and bringing traffic noise with them. Pure self-preservation therefore forces us to protect ourselves and our environment from this nuisance. This is the purpose of the "Bundesemissionsschutz" Law of 15.3.1974, the provisions of which will have far-reaching consequences for the railways. In Germany, a Ministry of Transport working group is now preparing the basis for a statutory rule which will take account of the peculiarities of railway traffic by means of allowances in determining the noise levels on railway routes. After describing the origins of ambient noise, the author examines noise emission in the vicinity of railway installations. Such emission is determined by standard measuring-point arrangements and measuring conditions as laid down by ORE and the relevant DIN publications. Special features of noise abatement measures are described, and the effectiveness of those already tested is assessed. [German]

Zboralski, D *Eisenbahntechnische Rundschau* Vol. 25 No. 10, Oct. 1976,  
7 pp

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

DOTL JC

10 149404

**DIESEL SMOKE: LEGISLATION AND CONTROL**

Legislative aspects of diesel smoke control in South Africa and Europe, the procedures for measuring smoke density and the effect of control at the time of writing are discussed. Comparisons are made between on-load smoke emission and free acceleration tests for a number of different vehicles. The problems of high altitude operation and turbocharging are discussed. Suggestions are made for the possible improvement of control methods with guidelines for the future.

Presented at the International Conference on Air Pollution, sponsored by the South African Department of Health and held at Pretoria University, April 26-29, 1976.

Tucker, LE (Johannesburg City Health Department, South Africa)  
Departement van Gesondheid van Suid-Afrika S.121, 1976, 19 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: Departement van Gesondheid van Suid-Afrika, Pretoria,  
South Africa



10 149439

**PREVENTION OF NOISE ON THE RAILWAYS IN THE CONTEXT OF ENVIRONMENTAL PROTECTION [Die Laermabwehr der Eisenbahnen im Rahmen des Umweltschutzes]**

After discussing the origin of noise in the environment, the author deals with noise caused by railway equipment. The ORE has already defined standard regulations as to the points at which measurements should be taken, and measuring procedures. These rules are given in the DIN standardisation documents. He then examines conditions and special requirements for noise control, and results obtained through certain measures and installations which have already proven satisfactory. He gives detailed figures for these results. [German]

Zboralski, D *Eisenbahntechnische Rundschau* Vol. 25 No. 10, Oct. 1976, pp 587-594, 4 Fig., 6 Phot., 8 Ref.

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

DOTL JC

10 149443

**DRAINAGE OF THE SOIL AND TREATMENT OF MUD IN THE CASE OF POLLUTION BY MINERAL OILS [Bodensanierung und Schlammbehandlung bei Verunreinigung durch Mineraloel]**

No Abstract. [German]

Risius, E *Eisenbahntechnische Rundschau* Vol. 25 No. 10, Oct. 1976, pp 632-636, 4 Fig., 2 Ref.

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

DOTL JC

10 149942

**RAILROAD NOISE RESEARCH PROGRAM [Onderzoekprogramma railverkeerslawaai]**

This report gives a list of the research planned with respect to railways, trams and underground railways. The list was drawn up by the Interministerial Commission on Noise Nuisance (I.C.G.) with a view to coordinating the research projects commissioned by the national government to support its policy on rail traffic noise. The research programme comprises research into practicable methods of measuring the noise emitted by rail traffic, research on the relation between the amount of noise emitted and its effect, measurement of vehicle noise emission, emission caused by shunting activities, zoning systems, criteria for new stock, research on the noise of warning installations and signal horns, and on noise emission from stations, listing of noise-sensitive receivers, financial consequences, and an investigation into vibration caused by rail traffic. The entire research programme includes 14 projects. /TRRL/ [Dutch]

Ministerie van Volksgezondheid en Milieuhygiene RL-H, Aug. 1976, 12 pp

ACKNOWLEDGMENT: Institute for Road Safety Research (SWOV60005E), TRRL (IRRD 224115)  
ORDER FROM: Ministerie van Volksgezondheid en Milieuhygiene, Dr. Reyersstraat, Leidschendam, Netherlands

10 151597

**BACKGROUND DOCUMENT/ENVIRONMENTAL EXPLANATION FOR PROPOSED INTERSTATE RAIL CARRIER NOISE EMISSION REGULATIONS, MARCH 1974**

Contents: Data base for the regulation; Railroad noise sources; Summary of what the proposed regulations will require; Enforcement considerations; Economic effects of a retrofit program; Environmental effects of proposed regulations; Selection of the proposed regulations. (Portions of this document are not fully legible.)

See also RRIS 10 134296 7602.

Environmental Protection Agency EPA/550/9-74/005, Mar. 1974, 330 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261397/4ST, DOTL NTIS

10 151721

**JOINT EPA/UMTA/FEA STRATEGY FOR URBAN TRANSPORTATION AND AIR QUALITY. VOLUME 2. PUBLIC-PRIVATE URBAN TRANSPORTATION MODAL MIXES**

The objective of this four-volume study is to formulate a basis for the design of a joint interagency action program which would simultaneously improve urban mobility and air quality and conserve petroleum resources. This second volume presents an algorithm for calculating the impacts on transportation energy use and pollutant emissions of alternative urban transportation mixes. The algorithm is used to compare the change in national urban energy use and pollutant emissions implied by the maximum conceivable diversion of 1990 urban auto travel to bus, rail and para-transit compared to the no-diversion case. This exercise is supported by appendices showing the derivation of the methodology and of the database. The volume also includes a discussion of issues, tradeoffs, and methodologies relevant to the local determination of a balanced modal mix in an individual metropolitan area.

See also Volume 1, PB-244473. Prepared in cooperation with Environmental Protection Agency.

Krzychowski, R Dei Rossi, JA Henneman, SS Putnam, ES Usowicz, TW

Interplan Corporation, Naval Underwater Systems Center, Urban Mass Transportation Administration, Environmental Protection Agency 7346-R-Vol-2, UMTA-RI-06-0005-74-1, Dec. 1974, 92 pp

Contract N00140-74-C-6026

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263841/9ST, DOTL NTIS

10 151722

**JOINT EPA/UMTA/FEA STRATEGY FOR URBAN TRANSPORTATION AND AIR QUALITY. VOLUME 3. THE POTENTIAL OF DUAL MODE**

Interdependence of goals of the three agencies, EPA, UMTA, and FEA generates this four-volume study. The common issue around which all three agencies' policies revolve is the use of the private auto involving both incentives and penalties to catalyze a change in existing urban travel characteristics. This third volume expresses INTERPLAN's judgment about the applicability, timing, and impact of dual mode urban transportation technologies. A three-system, three-phase, gradual evolution of demand for dual mode is suggested. The dual mode essay is prefaced by a short overview and comparison of the propulsion and energy use characteristics of conventional and future urban transportation modes.

See also Volume 2, PB-263 841. Prepared in cooperation with Environmental Protection Agency, Washington, D.C.

Krzychowski, R Henneman, SS

Interplan Corporation, Naval Underwater Systems Center, Urban Mass Transportation Administration, Environmental Protection Agency 7346-R-Vol-3, UMTA-RI-06-0005-77-3, Dec. 1974, 41 pp

Contract N00140-74-C-6026

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263842/7ST, DOTL NTIS

10 151723

**JOINT EPA/UMTA/FEA STRATEGY FOR URBAN TRANSPORTATION AND AIR QUALITY. VOLUME 4. INFORMATION DATA BASE: STATUS OF URBAN CONGESTION, AIR POLLUTION, AND ENERGY USE**

The objective of the study is to formulate a basis for the design of a joint program which would simultaneously improve urban mobility and air quality and conserve petroleum resources. This fourth volume contains INTERPLAN's initial definition of the transportation-related urban problems now faced by UMTA, EPA, and FEA, and their authority to cope with these problems. The current status of transportation-related urban congestion, air pollution, and energy usage is analyzed on a national level, and the future status likely to obtain if present trends continue unchecked is projected. Congestion and air pollution is also examined in four cities: Los Angeles, Philadelphia, Seattle, and Baltimore.

See also Volume 3, PB-263 842. Prepared in cooperation with Environmental Protection Agency, Washington, D.C.

Krzyszowski, R Henneman, SS Putnam, ES Usowicz, TW  
Interplan Corporation, Naval Underwater Systems Center, Urban Mass  
Transportation Administration, Environmental Protection Agency  
7346-R-Vol-3, UMTA-RJ-06-0005-77-1, Dec. 1974, 272 pp

Contract N00140-74-C-6026

ACKNOWLEDGMENT: NTIS  
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PB-263843/5ST, DOTL NTIS

10 151766

**TRANSPORTATION FACILITY PROXIMITY IMPACT ASSESSMENT**

This study provides techniques for the assessment of proximity impacts related to transportation facilities. The examination of proximity impacts included those related to highways and freeways, busways, and special operational improvements, transit, and new modes of transit. Proximity impacts are those direct and indirect effects which represent a significant change from existing or future community conditions. A two-stage evaluation was developed for the assessment of the following impact indicators: noise, air quality, traffic volume and accident experience, parking availability, pedestrian safety, land use, local fiscal effects, aesthetics, access/barrier, and neighborhood/community disruption. The report also includes an illustrative application of the assessment procedures to a candidate transportation project.

Prepared in cooperation with Gruen Associates, Los Angeles, Calif., and Bolt Beranek and Newman, Inc., Canoga Park, Calif., California State Dept. of Transportation, Sacramento, and Federal Highway Administration, Washington, D.C.

Booz-Allen and Hamilton, Incorporated, Gruen Associates, Incorporated, Bolt, Beranek and Newman, Incorporated, California Department of Transportation, Federal Highway Administration Final Rpt. BAH-GA-BBN-76-01, Mar. 1976, 296 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264160/3ST, DOTL NTIS

10 152435

**ESTIMATION AND CONSIDERATION OF THE SHINKANSEN NOISE FOR A NEWLY-ESTABLISHED LINE (NEW TOHOKU LINE)**

The Japanese government has noise standards which must be met by Japanese National Railways, including the extensions of its high-speed Shin Kansen lines. The control of noise and vibration from the passage of high-speed trains on elevated structures is described, along with methods of determining and measuring each source.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Nimura, T Ebata, M Takahashi, T (Tohoku University, Japan)  
Institute of Noise Control Engineering Proceeding 1976, pp 197-202, 7 Fig., 1 Tab.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York, 12601

DOTL TD892.188

10 152436

**DESIGNING A NATIONAL STUDY OF RAILWAY NOISE IN GREAT BRITAIN**

Phase I of a two-phase project to investigate railway noise in Great Britain is now in the data collection stage. Two major problems, subjects of this paper, have been site selection procedure and noise measurement methodology. Using a statistically drawn sample, a map-based noise level prediction method and an efficient noise measurement strategy, it has been possible to simultaneously estimate the proportion of residences in such proximity to rail lines that they may be annoyed by train noise, test all reasonable hypotheses about the causes and correlations of railway noise annoyance, and derive a mathematical model of physical characteristics of railway noise annoyance.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Fields, JM Walker, JG Large, JB (Southampton University, England)  
Institute of Noise Control Engineering Proceeding 1976, pp 203-208, 2 Tab., 4 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York, 12601

DOTL TD892.188

10 152437

**A TRAIN NOISE GUIDELINE FOR LONDON**

The possibility of a new high speed rail link from the, now defunct, Channel Tunnel to the centre of London highlighted the need for new guidelines to be used when assessing the environmental effects of railway noise. Initially, only the question of compensation for noise was considered but, with acute pressure on building land in London, the need for a planning guideline becomes of equal or greater importance particularly in connection with the development of housing sites near existing railways. This paper describes the development of a railway noise standard equivalent to the current practice for road traffic. The social reaction to noise in France and Great Britain is shown to be equivalent by comparing road traffic noise social surveys. A French railway noise survey is then used to establish any difference between average community reaction to road or rail noise. Finally, American data is used to establish how the percentage population annoyed varies with noise level.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Simson, J Deva-Aditya, N (Greater London Council)  
Institute of Noise Control Engineering Proceeding 1976, pp 209-212, 2 Fig., 7 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York, 12601

DOTL TD892.188

10 152438

**STUDYING THE NOISE IMPACT OF A RAILROAD GRADE CROSSING ELIMINATION PROJECT**

A grade crossing elimination project for the Long Island Railroad will elevate tracks carrying 8 to 12-car electric commuter trains about 20 feet above the residential community of Massapequa Park, New York. To assess the noise impact of the project--and to learn more about train noise and its measurement and analysis--the NYS Department of Transportation conducted an extensive study. This paper summarizes what was learned.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Bowlby, W (New York State Department of Transportation)  
Institute of Noise Control Engineering Proceeding 1976, pp 213-216, 4 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York, 12601

DOTL TD892.188

10 152439

**COMPUTER-ASSISTED PLANNING FOR RAIL TRANSIT NOISE CONTROL**

This paper describes a computer assisted methodology for planning rail system noise control. Noise control usually involves several sequential stages of planning and design. At each stage, interactions with other design factors are clarified, the number of design options is usually reduced, and the level of detail is increased for analysis of costs and performance. In contrast with highway planning, urban rail system planners and managers can control a very wide range of system design elements, e.g. both on vehicle and guideway.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Lotz, R (Transportation Systems Center)  
Institute of Noise Control Engineering Proceeding 1976, pp 221-224, 3 Fig., 2 Tab., 2 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York,  
12601

DOTL TD892.188

10 152440

**ENVIRONMENTAL NOISE ASSESSMENT OF RAILROAD  
ELECTRIFICATION**

Energy considerations are causing railroads, especially East Coast commuter lines, to reconsider electrification of main lines to replace or partially replace diesel-electric power. Among the secondary benefits, reduction in wayside noise is often cited as a significant environmental improvement. The noise problem may be more complex than assumed at first glance. Using a recently developed prediction model based on the highway noise computer model developed by the Transportation Research Center of the U.S. Department of Transportation, it is shown that wayside noise is strongly dependent on higher speeds attainable as a result of the track improvements associated with electrification. The exhaust noise from the diesel electric locomotive is replaced by wheel/rail noise which can at higher speeds be a more significant noise source. Replacement of the diesel-electric locomotives by high speed electric locomotives may show benefit only in that the new source is closer to the ground and as a result is subject to ground effects and shielding.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Hanson, CE (Bolt, Beranek and Newman, Incorporated)  
Institute of Noise Control Engineering Proceeding 1976, pp 191-196, 1  
Fig., 13 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York,  
12601

DOTL TD892.188

10 152441

**THE ANALYSIS AND CONTROL OF ROLLING NOISE IN  
URBAN RAIL TRANSIT SYSTEMS**

When an electric-powered steel wheel transit vehicle moving on straight, continuously welded rail passes an observer, the predominant noise heard is rolling noise. This is the noise produced by small-scale roughness on the running surfaces of the wheels and rails. The minute peaks and valleys of the surface roughness excite both the wheels and the rails, which in turn radiate a characteristics broadband noise. Before cost-effective control of this noise can be developed, the mechanism for its generation must be clearly understood. The study reported here undertook to develop analytical empirical formulas for the prediction of rolling noise that contain all the important parameters describing the wheel/rail dynamic system.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Remington, PJ (Bolt, Beranek and Newman, Incorporated)  
Institute of Noise Control Engineering Proceeding 1976, pp 233-236, 4  
Fig., 1 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York,  
12601

DOTL TD892.188

10 152442

**SUBWAY TUNNEL ACOUSTICS-INFLUENCE OF SOUND  
ABSORPTION TREATMENT OF TUNNEL WALLS**

One way of decreasing the noise level in subway systems is to treat the subway tunnel walls with sound absorption material. This has been done in some sections of the Washington Metropolitan Area Transportation System. The treatment has consisted of Pyrok spray-on on the lower parts of the walls. Totally the treatment covers approximately 20% of the circumference. To study the benefit of the treatment tests have been performed with a cannon as a sound source. The time history of cannon shots at different distances from the source has been evaluated.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Kihlman, T (Chalmers University of Technology, Sweden); Wilson,  
GP (Wilson, Ihrig and Associates, Incorporated)  
Institute of Noise Control Engineering Proceeding 1976, pp 229-232, 2

Fig., 2 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York,  
12601

DOTL TD892.188

10 152443

**NOISE AND VIBRATION IMPACT OF THE MBTA SUBWAY  
EXTENSION AT HARVARD SQUARE**

Federal guidelines for preparation of noise and vibration portions of environmental impact statements for rail transportation projects are minimal. Discussions could result in a more uniform approach to the preparation of these statements. Analysis of the noise and vibration environmental impact that may result from extension of a rapid transit line of the Massachusetts Bay Transportation Authority in Cambridge, Mass., is presented.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Wittig, LE Hanson, CE (Bolt, Beranek and Newman, Incorporated)  
Institute of Noise Control Engineering Proceeding 1976, pp 225-228, 4  
Fig., 4 Ref.

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York,  
12601

DOTL TD892.188

10 152444

**RAIL RAPID TRANSIT ASSOCIATED NOISE ANALYSIS**

This paper presents a simple analytical model for predicting wayside noise levels attributed to moving rail rapid transit trains. The physical problem treated by the model is defined as follows: given the receptor location relative to the rail track, the characteristics of passing trains (e.g., speed, length, headway, and the type of train), the rail track configuration (e.g., with or without sound barrier, and at-grade, elevated, or depressed roadbed), and the time period of interest, find the cumulative noise distribution at the receptor. The model provides a convenient method for analyzing potential community rail noise impacts for use in the planning and design of rapid transit projects.

Presented at the 1976 International Conference on Noise Control Engineering, Washington, D.C., 5-7 April 1976.

Chen, TC Michalove, RA (Parsons, Brinckerhoff, Quade and Douglas, Inc)  
Institute of Noise Control Engineering Proceeding 1976, pp 217-220

ACKNOWLEDGMENT: Institute of Noise Control Engineering  
ORDER FROM: Noise/News, P.O. Box 1758, Poughkeepsie, New York,  
12601

DOTL TD892.188

10 152663

**TRAIN GENERATED AIR CONTAMINANTS IN THE TRAIN  
CREW'S WORKING ENVIRONMENT**

This document contains data on the levels of air contaminants in the train crew's working environment. Measurements were made in locomotive cabs and cabooses of freight trains travelling through long tunnels and over mountainous terrain. In addition, measurements were performed in long-hood forward locomotives during through freight operations and in switchyard locomotives. The data from this study indicate that the breathing environment of railroad operating crews is acceptable within the guidelines of the published Occupational Safety and Health Administration (OSHA) standards. Appendix A covers the sources of air contaminants in the railroad environment and Appendix B gives a detailed description of the measurements in this study. A review of related studies is given in Appendix C.

Sponsorship was provided by the FRA, U.S. DOT.

Hobbs, JR Walter, RA Hard, T Devoe, DB  
Transportation Systems Center, (DOT-TSC-FRA-76-34) Final Rpt.  
FRA/ORD-77/08, Feb. 1977, 52 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265355/AS, DOTL NTIS

10 153085

**PROBLEMS OF ENVIRONMENT WITH VERY HIGH SPEED TRAINS [Problemes d'environnement des rames a tres grande vitesse]**

The most careful research and development have been carried out to ensure that lineside dwellers are caused minimum inconvenience when trains pass by successively. The main factor that can be controlled is the level of noise caused by running and steel wheel on steel rail contact. Measures can in fact be taken on the track and in the train. In the train, efforts have therefore been directed to reducing the amount of running gear and employing a design that reduces the level of noise created at the rail. It has thus been possible, at a normal traffic density of five trains 400 metres long an hour, to achieve a level expressing inconvenience that does not exceed 70 dB (A). Track laid in cuttings enables noise to be reduced most appreciably and in certain cases it is planned to install opaque lateral screens. [French]

Devaud, Y (French National Railways) *Revue Generale des Chemins de Fer* Dec. 1976, pp 795-796, 1 Ref.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer  
ORDER FROM: ESL

DOTL JC

10 153366

**NOTICE OF PROPOSED RULEMAKING ON SPECIAL LOCAL DETERMINATIONS PROCEDURES FOR INTERSTATE RAILROAD NOISE EMISSION STANDARDS AND INTERSTATE MOTOR CARRIER NOISE EMISSION STANDARDS AND GUIDELINES FOR STATE AND LOCAL GOVERNMENTS ON THE FILING AND PROCESSING OF APPLICATIONS FOR PREEMPTION WAIVER DETERMINATIONS**

No Abstract.

Environmental Protection Agency Standards Nov. 1976, 72 pp

ACKNOWLEDGMENT: Environmental Protection Agency  
ORDER FROM: Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., 20460

DOTL RP

10 153791

**THE IMPACT OF NOISE POLLUTION: A SOCIO-TECHNOLOGICAL INTRODUCTION**

This new work by authors from four disciplines (bio-technology, engineering, economics and anthropology) and three countries (USA, France and UK) provides a critical analysis of the scientific literature. The book is comprehensive in approach: it considers sources of noise from snowcats to stamping machines, from kitchen mixers to supersonic aircraft. The authors consider the following remedies: engineering solutions such as machine quietening; the social and economic policy instruments (taxes, subsidies, laws); the need to promote such solutions and, at a different level, the associated, and necessarily political, decision-making process. Consideration of such questions leads to the clear conclusion that the technological aspects of noise pollution are inseparable from the political and economic ones. The book raises searching questions about the role of value judgments in the apparently objective analysis of socio-technological issues.

Bugliarello, G Alexandre, A Barnes, J Wakstein, C  
Pergamon Press Monograph 1976, 475 pp, 84 Fig.

ORDER FROM: Pergamon Press, Incorporated, Maxwell House, Fairview Park, Elmsford, New York, 10523

10 157546

**RAILWAY NOISE AND VIBRATION AND THEIR ABATEMENT [Buller och vibrationer vid jaernvaegstrafik och medel foer deras minskning]**

The author gives a survey of the actual work and results concerning the following questions: Railway noise generation and propagation, noise and vibration levels inside and outside trains, measures against railway noise and vibration, annoyance and its characterization (exposure values) and limiting values. Some recent investigations concerning the prediction of railway noise as well as a short survey of previous and present work by ORE are given. [Swedish]

Lutz, R *Jarnvagsteknik* Vol. 44 No. 5/6, 1976, pp 114-138, 22 Fig., 1 Phot., 116 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48103

10 157550

**THE DANGERS OF RAIL TRAFFIC FOR MAN'S ENVIRONMENT [Zagrozenie naturalnego srodowiska czlowieka ze strony komunikacji kolejowej]**

The author describes the disturbances caused by the railways, noise in particular, and suggests various forms of protection to reduce their effects. [Polish]

Matuszek, J *Problemy Kolejnictwa* No. N71, 1977, pp 195-227

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Iemy Kolejnictwa, Warsaw, Poland

10 157676

**RAILROAD AND RAIL TRANSIT NOISE SOURCES**

The railroad or rail transit system design team must predict A-weighted, or preferably, octave band sound pressure levels near passing trains. This is the first step in estimating noise over any area of potential impact and in subsequent selection among noise abatement design alternatives. In this paper recently reported measurements of locomotive and railcar noise emission are reviewed and presented for use in making such design predictions.

Lotz, R *Journal of Sound and Vibration* Vol. 51 No. 3, Apr. 1977, pp 319-336

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157677

**RAILWAY NOISE ANNOYANCE IN RESIDENTIAL AREAS; CURRENT FINDINGS AND SUGGESTIONS FOR FUTURE RESEARCH**

Five published studies of railway noise annoyance in residential areas are reviewed. All the studies find that annoyance increases with railway noise levels and number of train passages. Two studies showed reactions to railway and road traffic noise as not strikingly different but the five studies do not agree on the actual relation between railway noise and annoyance. The apparent differences between the studies' findings may be due to genuine differences in annoyance reactions or to differences in study designs or measurement techniques. Some methods for ensuring more comparable results are suggested in the areas of sample design, questionnaire construction, observational data, and reporting of results.

Fields, JM *Journal of Sound and Vibration* Vol. 51 No. 3, Apr. 1977, pp 343-351

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157678

**TRAMWAY NOISE IN CITY TRAFFIC**

The extent of annoyance was studied in populations exposed to various levels of mixed tramway and motor traffic noise. The respondents were able to distinguish between the annoyance caused by the two types of traffic. With an increasing number of heavy vehicles annoyance due to traffic noise increased more than annoyance due to tramway noise in mixed city traffic.

Rylander, R Bjorkman, M Ahrlin, U *Journal of Sound and Vibration* Vol. 51 No. 3, Apr. 1977, pp 353-358

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157679

**NOISENESS OF HIGH SPEED TRAINS**

The noise signatures of three types of French trains (Aerotrain I 80, fast train (Rhodanien) and turbotrain) were presented in the laboratory to 24 persons who gave annoyance scores to each of them. The aim of this study was to compare the resulting comfort indices with some acoustic characteristics. The peak-level showed the best correlation and discomfort.

Vernet, M Vallet, M *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 359-361

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157680

**MEASURES AGAINST NOISE IN SUBWAY STATIONS**

With the construction of the Viennese Subway several noise control problems arose, among these the problem of noise control in the stations. One model station was constructed in advance and several sound absorbing measures performed step by step from 1974 to 1976, in order to measure the effect of various sound absorption measures and to derive criteria for the required noise control in further stations.

Lang, J Stani, M *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 365-367

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157681

**RAILWAY NOISE PROPAGATION**

The propagation of railway noise is characterised by the typical arrangement of noise sources on a moving train. The rates of sound attenuation with distance are determined for peak levels and for the equivalent steady sound levels in the cases of omnidirectional, and directional sources. The means of noise control within the path of sound propagation are discussed.

Rathe, EJ *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 371-388

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157682

**PROPAGATION OF AIRBORNE SOUND CAUSED BY TRAINS RUNNING AT A MAXIMUM SPEED OF 260 KM/H WITHOUT OR WITH A SOUND PROTECTION SCREEN**

At the instigation of the Deutsche Bundesbahn, sound phenomena caused by trains passing at distances of 7.5 m, 25 m, 50 m and 100 m, respectively, in the absence of a protection screen were tested on the Deutsche Bundesbahn experimental line for high-speed trains near Rheda-Oelde (Westphalia). Up to a distance of 100 m prevailing weather conditions could not be expected to have more than a minor effect on sound propagation. Thirty-three main tests were carried through while test trains were running on trial at a speed ranging between 165 and 260 km/h. A variety of sound measuring equipment was used both at the test points at no more than 5 m above the top of the rail and during analysis in the laboratory.

Koch, HW *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 389-392

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157683

**FACTORS AFFECTING RAILWAY NOISE LEVELS IN RESIDENTIAL AREA**

In order to be able to estimate noise levels in residential areas it is important to understand the mode of propagation of railway noise in open ground conditions. Experiments were conducted to investigate the effect of train type and speed as well as distance from the track on measured noise levels. The presence of cuts and embankments as well as the houses themselves also affect the noise levels. Data are presented which show the effect of all these parameters and a simple procedure is outlined that allows the maximum noise level at any position in a residential area to be estimated.

Walker, JG *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 393-398

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157685

**PREDICTION AND CONTROL OF NOISE FROM RAILWAY BRIDGES AND TRACKED TRANSIT ELEVATED STRUCTURES**

This paper reviews the current approaches to the prediction and control of noise radiation from railroad bridges and elevated rail transit structures. The results of noise measurements near a variety of bridge and elevated rail structures are summarized and these structures are rank ordered according to their sideline noise levels. Methods for the control of elevated structure noise are discussed and the results of actual field applications of these treatments are summarized. This article also describes a new analytical model capable of estimating the effects of structural parameters on both vibration transmission within, and noise radiation from, an elevated structure. A sample application of this model is used to evaluate several methods for noise abatement on a composite concrete deck, steel plate girder structure. The paper concludes with a set of recommendations for further research.

Kurzweil, LG *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 419-439

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157686

**PROPAGATION OF VIBRATIONS AND STRUCTURE-BORNE SOUND CAUSED BY TRAINS RUNNING AT A MAXIMUM SPEED OF 250 KM/H**

Measurements of vibration and structure-borne sound were carried through on the Deutsche Bundesbahn experimental line for high speed trains near Rheda-Oelde (Westphalia) at the instigation of the Deutsche Bundesbahn authorities. Measuring points were fixed at distances of 7.5 m, 15 m, 30 m, 50 m and 100 m from the track respectively. Additionally a pick-up was mounted at the base of the rail.

Koch, HW *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 441-442

ACKNOWLEDGMENT: British Railways  
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DOTL JC

10 157687

**FLOATING TRACK SLAB ISOLATION FOR RAILWAYS**

Where an underground railway is in existence, it is up to the developer to take what precautions may be necessary to provide an acceptable interior environment. Many a building has been isolated on resilient bearings from the ground-borne vibrations produced by an adjacent railway with the result that the occupants are unaware of the trains running underneath the building. The technique for the resilient mounting of large structures has been well developed, and there is a B.S.I. Draft for Development in which some guidelines have been established. Where a new underground railway is to be constructed close to or under existing properties it may be more expedient to isolate the railway. Several design of a "floating track slab" have been constructed, usually with very beneficial effect. Some of these floating track slabs are described in this contribution.

Grootenhuis, P *Journal of Sound and Vibration* Vol. 5 No. 3, Apr. 1977, pp 443-448

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

10 157911

**VENTILATION IN THE METRO [L'atmosphère du métro]**

The Paris Transport Authority, which conveys 4 million passengers per day on lines most of which are underground, has set 4 objectives for air-conditioning its installations. In summer, the temperature should not be more than 5 deg C higher than outside temperatures, air in tunnels should be renewed 4 times every hour, the speed of air currents must not exceed 5 m/s, and humidity must remain between 30 and 70 percent. Better ventilation systems will be installed, as well as air vents, equipment for air renewal and for ventilation in vehicles; biological climatic, thermal and aerodynamic studies will be carried out with the view to energy retrieval. [French]

Sutton, D Flahaut, J *Bulletin de Documentation et d'Information--RATP*  
Sept. 1976, 69 pp, 30 Fig., 7 Tab., 34 Phot., 4 App.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Regie Autonome des Transports Parisiens, 53 ter. Quai des  
Grands Augustins, B.P.70-06, 75271 Paris, France

10 157962

**ESTIMATING THE AIR POLLUTION COSTS OF TRANSPORT  
MODES**

This paper provides rough and aggregate measures of the economic costs imposed on society by air pollution from various transport modes in urban areas. An approximation is made of air pollution's money costs. Rough measures are precisely the inputs needed to design crude aggregate policy instruments.

Small, KA (Princeton University) *Journal of Transport Economics and Policy* Vol. 11 No. 2, May 1977, pp 109-132, 6 Tab., 46 Ref.

ORDER FROM: London School of Economics and Political Science, Houghton Street, Aldwych, London WC2A 2AE, England

DOTL JC

10 159473

**THE EXTERNAL SOUND LEVEL OF RAILBOUND TRANSPORT  
[Aussengeräusch von Schienenfahrzeugen]**

In past years comprehensive studies have been carried out regarding the external sound level of railbound transport. These studies were based on international measurement regulations observed by both European and non-European rail transport authorities. The report discusses the origin of noise nuisance caused by railbound transport and takes into consideration the vehicle itself, the superstructure and formation level of the railway track and the immediate location of the track section in question. In conclusion, some indications are given as to possible and in some instances already implemented means of relieving noise nuisance caused by railbound transport. /TRRL/ [German]

Stueber, C *Kampf dem Laerm Analytic* Vol. 23 No. 1, Feb. 1976, pp 20-26, 4 Fig., 2 Tab., 32 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-304372), Federal Institute of Road Research, West Germany

ORDER FROM: VJF Lehmanns Verlag, Agnes-Bernauer Platz 8, 8 Munich 21, West Germany

11 062502

**HIGH-SPEED GROUND TRANSPORTATION SYSTEMS  
ENGINEERING STUDY. TRACKED AIR CUSHION VEHICLE  
SYSTEMS**

The tracked air cushion vehicle is one of several advanced ground transportation systems being studied by TRW Systems Group for the Department of Transportation as a possible means of providing safe, high-speed, high-capacity transportation along densely populated areas such as the Northeast Corridor. Based on requirements and constraints chosen for an operational system, subsystem alternatives are evaluated and the selected subsystems are synthesized into a TACV system. Cost and performance are estimated over a range of parameters, such as design cruise speed (150 to 350 mph) and vehicle capacity (50 to 150 passengers per vehicle). The configuration defined consists of trainable, electrically powered TACV's which collect power from trackside power rails mounted on the side of a channel guideway. Propulsion is by linear induction motors with variable frequency speed control. Control of the vehicles, singly or in trains, is automated and centralized. The vehicles are supported on and guided by peripheral jet air cushions with high pressure air provided by electrically driven axial flow compressors. (Author)

TRW Systems Group Final Rpt 06818-6039-RO-00, May 1970, 623p

Contract DOT-O-353-66

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-195030, DOTL NTIS

11 091186

**TRACKED AIR CUSHION VEHICLES AND MAGNETIC  
LEVITATION (A BIBLIOGRAPHY WITH ABSTRACTS)**

Data relative to the design, dynamics, and feasibility of tracked air cushion vehicles and magnetic levitation systems are presented in these Government-sponsored research reports. Approximately 70 abstracts are included in this bibliography.

Habercom, GEJ  
National Technical Information Service Jan. 1975, 75 ppACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-75/114/9ST, DOTL NTIS

11 092454

**HEADWAY SEPARATION ASSURANCE SUBSYSTEM (HSAS)**

This report discusses the design, fabrication, test and evaluation of a Headway Separation Assurance Subsystem (HSAS) capable of reliable, failsafe performance in PRT systems. The items designed include both hardware and software packages. These packages are applicable, with minimum modification, to any PRT system, and are designed to allow economical full-scale installation. Tests were performed at 9-3/4 mph with 8-1/3 seconds headway.

Evans, RT Cowes, K  
Alden Self-Transit Systems Corporation, Transportation Systems Center,  
Urban Mass Transportation Administration Final Rpt. UMTA-  
MA-06-0031-75-4, DOT-TSC-UMTA-75-11, July 1975, 118 pp

Contract DOT-TSC-421

ACKNOWLEDGMENT: NTIS, UMTA  
ORDER FROM: NTIS, Repr. PC, Microfiche

PB-244667/2ST

11 143945

**EXPERIMENTS IN GUIDEWAY-LEVITATION VEHICLE  
INTERACTION DYNAMICS**

This investigation involves the design and interpretation of laboratory-scale dynamic experiments of vehicles traversing multiple-span or cable-stayed guideways. The nondimensional responses of such systems, including critical span bending moments and vehicle heave accelerations, depend on the system parameters derived in Chapter 2. A point load 'vehicle' and two vehicles closely resembling advanced operational prototypes were designed and tested: the 150 mph Prototype Tracked Air Cushion Vehicle (PTACV), and the 300 mph Tracked Levitated Research Vehicle (TLRV). In Chapter 3, general experiments are designed, all based on these dimensionless system

parameters and the capability of instrumentation and data processing minicomputers to measure and interpret response data. The remaining chapters include discussions and comparisons of response data for critical six and three-span guideway moments and for rms vehicle heave accelerations.

Wilson, JF  
Duke University, Federal Railroad Administration Final Rpt. FRA-  
/OR&D-76/259, Jan. 1976, 88 pp

Contract DOT-FR-4-4098

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257941/5ST, DOTL NTIS

11 143946

**MODELS FOR ASSESSING TRIP DEPENDABILITY IN  
AUTOMATED GUIDEWAY TRANSIT NETWORKS**

Equipment failures and how to correct them are significant factors affecting the quality of service of Automated Guideway Transit (AGT) systems. The network configuration, subsystem failure rates, and recovery modes interact to provide the operational configuration that passengers ultimately view in terms of the ability of the AGT system to provide reliable service for their trip. This report describes a procedure that permits evaluation of the Group Rapid Transit networks in terms of trip dependability. The model uses a flow representation of vehicle traffic determined by network topography, demands for travel, and operational service policy. The model has its most useful application in the intermediate design stage where there are tradeoffs to be evaluated.

Kershner, DL Roesler, WJ  
Johns Hopkins University, Laurel, Urban Mass Transportation Administra-  
tion Tech Rpt. APL/JHU/CP-047TPR036, UMTA-MD-06-0018-76-2,  
Aug. 1976, 64 pp

Contract DOT-UT-30010

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-258129/6ST, DOTL NTIS

11 146104

**SUPERCONDUCTING MAGNETS (A BIBLIOGRAPHY WITH  
ABSTRACTS) [Rept. for 1964-Aug 76]**

The cited reports include research on materials studies, theory, design, and applications of superconducting magnets. Examples of the applications include particle accelerators, MHD power generation, superconducting generators, nuclear fusion research devices, energy storage systems, magnetic levitation, and bioinstrumentation.

Supersedes NTIS/PS-75/636.

Reimherr, GW  
National Technical Information Service Bibliog. Oct. 1976, 251 pp, 246  
Ref.ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-760771/6ST, DOTL NTIS

11 146461

**LIFE CYCLE COST MODEL FOR COMPARING AGT AND  
CONVENTIONAL TRANSIT ALTERNATIVES**

Some recent cost comparisons of conventional and Automated Guideway Transit (AGT) have directly used data from experimental AGT systems. These results are biased in that comparisons are made between an immature AGT system and mature forms of conventional transit. In effect, the analysis has not captured the long term advantage of AGT, which results from the substitution of technology for labor. An operational computer model is described which make appropriate cost comparisons. It is a life-cycle cost model that time-phases costs, accounts for the time value of money, incorporates time phased efficiency gains and provides for the impact of relative and general inflation. The model has been tested with AIRTRANS data from the AIRTRANS Assessment Project. Results are illustrative only. Conclusions concerning AIRTRANS operation are not possible as the data used was preliminary and is already out of date with more recent data showing significant cost reductions.

(PC A05/MF A01)



Graver, CA Jenkins-Stark, JF  
General Research Corporation, Urban Mass Transportation Administration Final Rpt. CR-1-702, UMTA-CA-06-0090-76-1, Feb. 1976, 86 pp

Contract DOT-UT-60044

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-259529/6ST, DOTL NTIS

**11 146974**  
**THE VERY HIGH SPEED TRANSIT SYSTEM**

The Very High Speed Transit or 'VHST' concept was put forward some years ago in response to the search for a pollution-free transport method that could operate at speeds competitive with aircraft. The general principles are relatively straightforward: Electromagnetically levitated and propelled cars in an evacuated tunnel. The VHST's "tubecraft" ride on, and are driven by, electromagnetic (EM) waves much as a surfboard rides the ocean's waves. The EM waves are generated by pulsed or by oscillating currents in electrical conductors that form the "roadbed" structure in the evacuated "tubeway." Opposing magnetic fields in the vehicle are generated by means of a loop of superconducting cable carrying on the order of a million amperes of current. The system is highly conservative of energy. Economic, environmental and technical aspects are briefly considered.

Previously announced as N73-13990.

Salter, RM  
Rand Corporation P-4874, Aug. 1972, 19 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A032172/9ST, DOTL NTIS

**11 147009**  
**POSSIBILITIES OF ENERGY RECUPERATION BY GRAVITY TRACTION IN PUBLIC TRANSIT SYSTEMS**

About 70 or 80 percent of the traction energy employed in the operation of metropolitan and suburban railways on lines with the stops arranged at short intervals is used for the kinetic energy of the vehicles. If at all, this energy is recuperated only at a rate of approximately 30 percent. Gravity traction allows the kinetic energy of the vehicles to be recuperated at a rate of about 90 percent during deceleration, which would decrease the overall energy input by 63 to 72 percent. However, this requires the line to be arranged uphill and downhill, and a traction system not based on the interaction of forces between a wheel and a rail might be needed. The result would be high average speeds, without requiring more traction power. A relationship is established between the parameters of the trackway and the change of the vertical and horizontal acceleration values as a function of time. (Author) [German]

In German; English Summary.

Jung, V  
Nuclear Research Center (Kernforschungszentrum) KFK-1793, Dec. 1975, 50 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

N76-316 90/0ST, DOTL NTIS

**11 147379**  
**ANALYSIS AND DESIGN OF STEERING CONTROLLERS FOR AUTOMATED GUIDEWAY TRANSIT VEHICLES**

A study of steering control systems for Automated Guideway Transit Systems has been conducted which has included a state-of-the-art survey of steering control and an evaluation of vehicle dynamic models for steering controller design. The performance of a typical AGT vehicle using a mechanical reference steering system has been determined for direct proportional, partial state feedback and full state feedback steering controllers. RMS tracking errors and RMS vehicle acceleration levels are computed for selected vehicle controllers with the vehicle traveling on a mainline track described in terms of its random irregularity properties.

Errata sheet inserted.

Shladover, S Fish, R Richardson, HH Wormley, DN  
Massachusetts Institute of Technology, Urban Mass Transportation Administration Final Rpt. UMTA-MA-11-0023-76-1, Sept. 1976, 150 pp

Contract DOT-MA-11-0023

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261327/1ST, DOTL NTIS

**11 147380**  
**ASSESSMENT OF OPERATIONAL AUTOMATED GUIDEWAY SYSTEMS- AIRTRANS (PHASE I)**

The report presents the results of an evaluation study of AIRTRANS, a unique, automated guideway system located at the Dallas/Fort Worth Airport. AIRTRANS was designed to move passengers, employees, baggage, mail, trash and supplies. The newest and largest system of its type in the world, it comprises 13 miles of single lane guideway and 68 vehicles, and serves 53 stations at different points in the airport complex. The system is one of the first intra-airport transit systems conceived, designed and constructed as an integral part of the airport development. The study, conducted with the cooperation of the Dallas/Fort Worth Regional Airport and the Vought Corporation, was intended to codify the information and experience gained in the planning, development, implementation and initial operation of the system into an integrated body of knowledge from which those concerned with any phase of future, similar system planning and implementation could profit.

Prepared in cooperation with Mitre Corp., Bedford, Mass.

Kangas, R Lenard, M Marino, JJ Hill, JH Bowe, J  
Transportation Systems Center, Mitre Corporation, Urban Mass Transportation Administration, (UMTA-MA-06-0067) Final Rpt. DOT-TSC-UMTA-76-15, UMTA-MA-06-0067-76-1, Sept. 1976, 291 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261339/6ST, DOTL NTIS

**11 147396**  
**LINEAR INDUCTION MOTOR ELECTRICAL BRAKING TEST**

This report describes the electrical braking characteristics of a 2500-hp (at 250 mph) linear induction motor (LIM), which is used to propel and brake the LIM research vehicle. Three methods of electrical braking were investigated: ac dynamic braking, dc eddy current braking, and plugging. From the data acquired the following information was derived and is presented herein for each of the braking methods investigated: (1) LIM electrical braking characteristics in terms of braking force developed as a function of vehicle speed, with all data referred to a 2000-A primary current, (2) powerplant characteristics, (3) the location and magnitude of the braking energy dissipated, and (4) power and control equipment requirements. Pertinent LIM design information is also included to enable independent investigators to correlate analytical predictions with the test data published herein.

Powell, RB  
AiResearch Manufacturing Company, Federal Railroad Administration Final Rpt. 75-11969-Rev-1, FRA/ORD-76/264, Apr. 1976, 115 pp

Contract DOT-FR-40016

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261851/0ST, DOTL NTIS

**11 147397**  
**LINEAR INDUCTION MOTOR ELECTRICAL PERFORMANCE TEST**

This report describes the electrical performance characteristics of a 2500-hp (at 250 mph) linear induction motor (LIM), based on data acquired while propelling the LIM research vehicle over a 0-to-250-mph speed range. Pertinent LIM design information is included to enable independent investigators to correlate their mathematical models with the test data published herein. The principal end product of this effort is tabulated LIM performance, in terms of thrust, voltage, power factor, efficiency, input and output power, velocity, and percent slip at five excitation frequencies and at 1-Hz slip frequency increments, with all data referred to a 2000-A primary current. From the acquired data the following information was derived and included in this report: LIM performance characteristics (thrust vs slip at constant current, power factor vs slip, and efficiency vs slip), voltage-and current-source presentation of LIM data, influence of LIM end effects, and other LIM data relevant to future design activities.

Powell, RB  
AiResearch Manufacturing Company, Federal Railroad Administration  
Final Rpt. 75-11919-Rev-1, FRA/ORD-76/265, June 1976, 161 pp

Contract DOT-FR-40016

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261856/9ST, DOTL NTIS

11 149974

**INFLUENCE OF THE VEHICLE SPEED ON THE COST OF THE INFRASTRUCTURE IN A RAPID SURFACE TRANSPORT SYSTEM** [Influence de la vitesse des véhicules sur le coût de l'infrastructure d'un système de transport terrestre rapide]

A study (in collaboration with SETRA) on infrastructure costs for a hovertrain service operating at three speeds: 250, 300, and 500 km/h. The route envisaged, Metz-Strasbourg-Mulhouse (210 km), passes through regions with widely varying topography (across the Vosges and the Alsace Plain). The financial assessment does not take into account track, station and city centre installations, but determines approximate values as regards the correlation between infrastructure costs and the operating speed of the vehicles. [French]

Institute of Transport Research No. 14, Sept. 1976, 60 pp, 2 Fig., Tabs.,  
Photos., Apps.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Institute of Transport Research, Avenue du General Mall-  
eret-Joinville, Boite Postale 28, 94 Arcueil, France

11 150468

**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 was excellent.

Muhlenberg, JD  
Mitre Corporation, Federal Railroad Administration Tech. Rpt.  
MTR-6618, FRA/ORD-76/25, Oct. 1975, 52 pp

Contract DOT-FR-30015

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261921/1ST, DOTL NTIS

11 151149

**VEHICLE OPERATING STRATEGIES FOR SMALL AUTOMATED GUIDEWAY TRANSIT NETWORK**

The report discusses Automated Guideway Transit (AGT) systems that will offer demand-activated service using an on-line dispatching capability. The AGT system management is identified in this report as a large-scale, multi-criterion optimization problem, and the approach taken is to formulate the service optimization problem into a mathematical form so that known techniques could be used to arrive at solutions. Emphasis is on heuristic solutions by approximation rather than exact solutions through analysis. Actual operating strategies are constructed for point-to-point service with intermediate stops. The strategy involving squared terms of waiting time is found to be optimal for a wide range of demands. The computer simulation reveals that although non-controllable parameters, such as network topology and demand distribution, dominate the basic traffic pattern, service characteristics can be improved by selecting a best feasible strategy based upon the basic traffic pattern.

Yen, AM  
Mitre Corporation, Urban Mass Transportation Administration, (UM-  
TA-VA-06-0025) UMTA-VA-06-0025-77-1, Aug. 1976, 116 pp

Contract DOT-UT-50016

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262480/7ST, DOTL NTIS

11 151774

**SEATTLE PRT STUDY. VOLUME I. SUMMARY**

In 1969 and 1970, the City of Seattle became one of five selected medium sized cities to be included in the Center Cities Transportation Project (CCTP). Increased interest in PRT/people-mover technology culminated in a three-party agreement and ultimately led to the current investigation and analysis of automated transit technology. The feasibility of a PRT or people-mover system application is being evaluated in a two-phase study: Phase 1- Site-selection for a people-mover system, and Phase 2- System implementation for the locales selected in Phase 1 study. This is the Interim Report for Phase 1 of the PRT study and is presented in two volumes. This volume consists of a general overview of the total Phase 1 study.

Prepared by VTN Washington, Inc., Bellevue. Sponsored in part by Puget Sound Governmental Conference, Seattle, Wash., Municipality of Metropolitan Seattle, Wash., and Washington State Legislative Transportation Committee, Olympia. See also Volume 2, PB-264 299.

Basmaciyani, H Stappler, RF  
VTN Washington Incorporated, Puget Sound Governmental Conference,  
Municipality of Metropolitan Seattle, Washington State Legislature,  
Urban Mass Transportation Administration Intrm Rpt. UMTA-  
WA-09-0006-77-1, Mar. 1974, 104 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264298/1ST, DOTL NTIS

11 151775

**SEATTLE PRT STUDY. VOLUME II. TECHNICAL SUPPLEMENT**

In 1969 and 1970, the City of Seattle became one of five selected medium sized cities to be included in the Center Cities Transportation Project (CCTP). Increased interest in PRT/people-mover technology culminated in a three-party agreement and ultimately led to the current investigation and analysis of automated transit technology. The Technical Supplement Volume consists of ten individually self-contained Appendices documenting a specific study or feature.

Prepared by VTN Washington, Inc., Bellevue. Sponsored in part by Puget Sound Governmental Conference, Seattle, Wash., Municipality of Metropolitan Seattle, Wash., and Washington State Legislative Transportation Committee, Olympia. See also Volume 1, PB-264 298.

Basmaciyani, H Stappler, RF  
VTN Washington, Incorporated, Puget Sound Governmental Conference,  
Municipality of Metropolitan Seattle, Washington State Legislature,  
Urban Mass Transportation Administration Intrm rpt. UMTA-  
WA-09-0006-77-2, Mar. 1974, 213 pp

ACKNOWLEDGMENT: NTIS  
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PB-264299/9ST, DOTL NTIS

11 151802

**ENVIRONMENTAL IMPACT ISSUES FOR AUTOMATED GUIDEWAY TRANSIT SYSTEMS**

The focus of the study is on the social and environmental aspects. Section I discusses some of the critical non-engineering issues that influence social acceptability of AGT in the urban areas, such as, crime, system safety, and community disruption. Concepts presented reflect the opinion of a variety of recent publications, including the environmental impact statement guidelines of a number of Federal Government agencies. Section I also contains a summary of impacts, sources, and solutions. Tables VI-XXVIII list twenty-three impact areas that influence social acceptability of AGT in urban areas. For each of these areas, representative possible impacts, system sources, and solutions are presented. The intent here is to summarize and group prevalent sources and candidate solutions together with each of the categories of impact which are discussed in this paper. Section II examines three hard environmental impact items, i.e., the three most important engineering factors: acoustic noise, electromagnetic interference, and power consumption.

Nussbaum, E Zumwalt, B

Mitre Corporation, Urban Mass Transportation Administration, (UMTA-VA-06-0025) MTR-7268, UMTA-VA-06-0025-77-2, Aug. 1976, 144 pp

Contract DOT-UT-50016

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263640/5ST, DOTL NTIS

11 151807

#### MORGANTOWN PERSONAL RAPID TRANSIT SYSTEM

The Urban Mass Transportation Administration (UMTA) of the U.S. Department of Transportation selected Morgantown, West Virginia, as a site for a prototype personal rapid transit system demonstration because it presented the challenges that such a system must overcome to be successful in any location. This Morgantown Personal Rapid Transit (MPRT) system was funded by UMTA as a research and development task to provide a demonstration system with the following objectives: (1) Demonstrate the feasibility of an automatic, personalized urban transit system; (2) Demonstrate the applicability of the concept to national urban needs; and (3) Qualify the concept for other locations using the UMTA capital grant funds. This MPRT final report contains a description of the final delivered system and a summary of the activities undertaken in its development, including system and subsystem plans, specifications, drawings, test data, and test evaluation. This MPRT system connects downtown Morgantown with two West Virginia University locations, and also provides passengers with non-stop direct to destination service between the central business district and the Evansdale and downtown campuses of West Virginia University.

Boeing Company, Urban Mass Transportation Administration, (UMTA-WV-06-0005) Final Rpt. D191-60016-1, UMTA-WV-06-0005-77-1, Nov. 1975, 229 pp

Contract DOT-UT-20007

ACKNOWLEDGMENT: NTIS  
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PB-263673/6ST, DOTL NTIS

11 151863

#### VEHICLE FOLLOWER LONGITUDINAL CONTROL FOR AUTOMATED GUIDEWAY TRANSIT VEHICLES

Continuing interest in the use of public transit to help solve problems related to urban transportation has pointed to the use of relatively small automated transit vehicles as a method for providing expanded transit service without the labor costs and reliability problems associated with the bus and without the high capital costs associated with rapid rail systems. Two philosophies for longitudinal control for short headway automated guideway transit (AGT) systems have evolved—(1) the vehicle-following concept, and (2) the point-following concept. This study is concerned with vehicle-follower control at relatively short headways. The objective of this research is to examine basic considerations in vehicle-follower longitudinal control for small, automated transit vehicles operating at moderate speeds and short headways. The relationship between spacing policy, system nonlinearities, and dynamic response of strings of vehicles is discussed.

Caudill, RJ Garrard, WL  
Minnesota University, Minneapolis, Urban Mass Transportation Administration, (UMTA-MN-11-0002) UMTA-MN-11-0002-77-1, Feb. 1977, 282 pp

ACKNOWLEDGMENT: NTIS  
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PB-264554/7ST, DOTL NTIS

11 152604

#### DEVICE TO MEASURE FORCE ANGLE OF A LINEAR SYNCHRONOUS MOTOR

A force angle measurement device capable of measuring the displacement between the fundamental fields established by the linear synchronous motor (LSM) vehicle magnets and the three phase track is described. The paper indicates that the force angle is fundamental to the understanding of the LSM steady state and transient behavior and effective operation will necessarily include control of this angle. Tests on a small model facility show the device operating over a 360 degree range. Results are shown for the vehicle during steady state and transient conditions.

Dawson, GE Schwalm, L Unteregelsbacher, E *IEEE Transactions on Indust Elect & Control Instru* Nov. 1976

ACKNOWLEDGMENT: EI (EIX770300134)  
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DOTL JC

11 152605

#### MECHANICAL SUSPENDED VEHICLE WITH AN ACTIVE GUIDE-WAY

The paper presents a new technique in the field of magnetic levitation used in conjunction with linear propulsion systems, which uses combined generation of forces for levitation, propulsion, and guidance. Main feature is the application of a synchronous linear motor with an active guide-way integrated into the suspension system. As an immediate consequence of the twofold utilisation of the magnetic field, substantial savings in materials and power requirement are obtained. A pilot plant set up to test the concept is described.

Presented at the biennial International Conference of Hovercraft, Hydrofoils & Advanced Transit Systems, May 17-20, 1976, Amsterdam, Netherlands.

Weh, H Mosebach, H Deleroi, W  
International Hydrofoil Society Conf Paper 1976

ACKNOWLEDGMENT: EI (EIX770300216)  
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11 152606

#### PENDAIR LIGHT RAPID TRANSIT

The paper sets out the reasons for choosing rapid transit as a first application for the Pendair suspension system and distinguishes between transit and other urban transport functions. A description of Pendair Light Rapid Transit, its performance, economics, and implementation programme, is given and some aspects of environmental intrusion are discussed. Attention is drawn to the relatively high conventional content of the Pendair system and its mode of operation which reduces development risks. Comparisons are made with conventional rail rapid transit and other innovational systems.

Presented at the biennial International Conference of Hovercraft, Hydrofoils & Advanced Transit Systems, May 17-20, 1976, Amsterdam, Netherlands.

Bliss, DS  
International Hydrofoil Society Conf Paper 1976, 18 Ref.

ACKNOWLEDGMENT: EI (EIX770300218)  
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11 152607

#### ASTROGLIDE: THE ADVANCED AUTOMATIC GUIDEWAY TRANSIT SYSTEM

The paper describes the successful application of linear induction motor (LIM) propulsion for an operational (AGT) monorail transit system and advanced transverse flux motors (TFM) in a people-moving overhead monorail system. The monorail system was installed at Dallas, Texas. The monorail is in the form of a continuous two-way loop approximately 1.5 miles long with three stations and six automatic switches. There are 10 ten-passenger cars originally propelled with a system of rotary induction motors coupled through eddy-current clutches to differential gear boxes driving traction wheels on the lower flanges of the I-beam overhead rail. To eliminate traction problems, improve reliability and reduce maintenance costs, the propulsion system has been up-graded to linear induction motors with all solid-state speed controls. A second car was fitted with advanced state-of-the-art transverse flux motors, capable of speeds of more than 50 mph on power line frequency. The performance of this car is compared with the performance of the first LIM propelled car and the original traction-wheel propelled car.

Presented at the biennial International Conference of Hovercraft, Hydrofoils & Advanced Transit Systems, May 17-20, 1976, Amsterdam, Netherlands.

Scelzo, GP  
International Hydrofoil Society Conf Paper 1976

ACKNOWLEDGMENT: EI (EIX770300215)  
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11 152609

**US DEVELOPMENTS IN ADVANCED TRANSIT SYSTEMS**

While fixed right-of-way transit systems of conventional rail type are technologically mature and ready for deployment, the high costs and low rate of traffic diversion are causing planners to rethink the feasibility of using such systems. The increasing social problems of the automobile as a mode, and the apparent difficulties with conventional transit pose a dilemma; this has encouraged several large US manufacturing firms to attempt to develop more advanced modes using full automation, small vehicles, short headways and demand-responsive operation. These developments have been fraught with enormous difficulties, and have not yet produced a truly advanced system that could begin to resolve the dilemma posed previously. Some institutional changes that might increase the rate of development of new systems are suggested.

Presented at the biennial International Conference of Hovercraft, Hydrofoils & Advanced Transit Systems, May 17-20, 1976, Amsterdam, Netherlands.

Ross, HR

International Hydrofoil Society Conf Paper 1976

ACKNOWLEDGMENT: EI (EIX770300219)

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11 152614

**ELECTRODYNAMIC LEVITATION FOR TRACKED LONG-DISTANCE TRAFFIC**

Statistical data and a prognosis by the German Institute for Economic Research of developments in private transport in West Germany until the year 2000 indicate that there is still a future for tracked transport systems, especially in view of energy supply considerations. For this reason, we must welcome the investigations by the Federal Ministry for Research and Technology into the limits of the rail/wheel system and the scope for other transport systems. A consortium comprising AEG, BBC and SIEMENS has decided to develop electrodynamic levitation for tracked long-distance traffic with the aim of integrating this in the existing railways system without requiring modifications to the latter. After discussing basic principles and procedures, the author reports on the present stage of development and testing at Erlangen and presents ideas on further planning and the evaluation of future tests. The objective is to produce the first quasi-practical test vehicle which will undergo trials on a new experimental line which is not to be built at Donauried. [German]

Lichtenberg, A *Eisenbahntechnische Rundschau* Vol. 25 No. 12, Dec. 1976, 12 pp

ACKNOWLEDGMENT: British Railways

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

DOTL JC

11 152781

**PARALLEL-CONNECTED LINEAR MOTOR TRANSPORTATION SYSTEMS 1, 2, 3**

Some ideas of the philosophy which should be applied when developing our future transport systems are presented. An idea is explained for an integrated transport scheme and a parallel-connected linear motor (PCLM) which will be used in the proposed scheme is described.

Lamb, C *Electrical Engineer* Vol. 53 No. 5, May 1976, 11 pp, 1 Ref.

ACKNOWLEDGMENT: EI (EIX770200035)

ORDER FROM: ESL

11 152783

**LONGITUDINAL CONTROL TECHNIQUES FOR AUTOMATED GUIDEWAY TRANSIT**

The designer of an automated guideway transit system may select a number of different approaches to vehicle longitudinal control. These approaches may be broadly classified into point-follower and vehicle-follower divisions. Control in the former case reduces to the problem of tracking a deterministically generated point while vehicle-follower control involves manipulation of vehicle position and velocity relative to other vehicles in the immediate vicinity. The selected policy has implications on the performance and hardware configuration of the vehicle longitudinal control system. This paper reviews some of the fundamental considerations in the design of

point-and vehicle-follower vehicle longitudinal control systems in the context of recent domestic and European system developments.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

MacKinnon, D (Urban Mass Transportation Administration)

Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 232-238, 25 Ref.

ACKNOWLEDGMENT: EI (EIX770200039)

ORDER FROM: ESL

11 152786

**ON LINEAR SYNCHRONOUS MOTOR (LSM) FOR HIGH SPEED PROPULSION**

Linear synchronous motor (LSM) is under active investigation for electro-dynamically suspended high speed vehicle. This paper presents the steady state performance characteristics of the 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 in this paper: 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. LSM is a relatively new technology and has potential in high speed propulsion.

Presented at the 10th IEEE Industry Application Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

Sen, PC (Queen's University, Canada)

Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 261-267, 12 Ref.

ACKNOWLEDGMENT: EI (EIX770200043)

ORDER FROM: ESL

11 152793

**PREDICTED AND MEASURED FINITE-WIDTH EFFECTS IN LINEAR INDUCTION MACHINES**

A new method of calculating the variation of the magnetic flux density with the dimension perpendicular to the flux and motion directions has been developed for MHD induction machines. The force and power densities and totals are also determined. The new method is explained and compared with previous methods of calculating finite-width effects. The agreement of the calculated field profiles with some initial measurements is excellent.

Presented at the IAS (IEEE Industrial Applications Society) 10th Annual Meeting, Conference Record, Sept. 28-Oct. 2 1975, in Atlanta, Georgia.

Pierson, ES (Illinois University, Chicago); Hanitsch, R Huehns,

T Mosebach, H

Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 943-948, 12 Ref.

ACKNOWLEDGMENT: EI (EIX770200051)

ORDER FROM: ESL

11 152794

**DYNAMIC CIRCUIT THEORY OF THE REPULSIVE MAGNETIC LEVITATION SYSTEM**

A generalized machine theory formulation is derived for the repulsive magnetic levitation system consisting of flat superconducting magnets interacting with flat finite width strip conducting guideways. Experimental verifications are presented.

Ooi, BT (McGill University, Canada)

Institute of Electrical and Electronics Engineers, (75CH0999-31A) Conf Paper 1975, pp 949-955, 16 Ref.

ACKNOWLEDGMENT: EI (EIX770200052)

ORDER FROM: ESL

11 152795

**FINITE LENGTH EFFECTS IN LINEAR INDUCTION MACHINES WITH DIFFERENT IRON CONTOURS**

Finite iron and winding lengths are significant factors in determining the performance of linear induction machines. This study provides information on the effect of the iron contour on machine performance, and also aids in the evaluation of other analytical models by pointing out the importance of the proper treatment of finite iron length. The analytical model is based on Fourier series expansions of the electromagnetic quantities and the air-gap length. The magnetic flux density, current density, force density, and efficiency are compared for six iron contours. One case with a graded winding is also considered.

Presented at the IAS (IEEE Industrial Applications Society) 10th Annual Meeting, Conference Record, Sept. 28-Oct. 2 1975, in Atlanta, Georgia.

Mosebach, H (Technical University of Braunschweig, West Germany); Huehns, T Pierson, ES Herrmann, D  
Institute of Electrical and Electronics Engineers, (75CH0999-31A) Conf Paper 1975, pp 935-942, 20 Ref.

ACKNOWLEDGMENT: EI (EIX770200050)  
ORDER FROM: ESL

11 152796

**COMBINED SYSTEM OF PROPULSION AND GUIDANCE BY LINEAR SYNCHRONOUS MOTORS**

This paper describes the principles, various characteristics and test results of a combined system of propulsion and guidance by linear synchronous motors (CSPG) suitable for high speed levitated trains. The CSPG proposed is a very economical system without usual guidance coils on the track. Instantaneous propulsion and guidance forces are obtained by computer simulation, and it is found how the train displacement, phase angle of the armature current and train speed affect the characteristics of a CSPG. It is also found that the computed results agree with the test results of the rotating experimental facility.

Presented at the IAS (IEEE Industrial Applications Society) 10th Annual Meeting, Conference Record, Sept. 28-Oct. 2 1975, in Atlanta, Georgia.

Maki, N (Hitachi Limited); Okuda, H Tatsumi, T Fujie, J Iwahana, T  
Institute of Electrical and Electronics Engineers, (75CHO999-31A) Conf Paper 1975, pp 388-392

ACKNOWLEDGMENT: EI (EIX770200053)  
ORDER FROM: ESL

11 152799

**THREE-DIMENSIONAL ANALYSIS METHOD FOR LINEAR INDUCTION MACHINES**

An original three-dimensional method for calculation of electromechanical characteristics of linear induction motors is described in this paper. Such a method, rather expansive in computer time is to be used to check that a motor designed by a simple method fits well all the constraints imposed by the design contract. The use of conformal mapping technics and theory of electromagnetic images makes this method as general as possible and allows its use for any electromagnetic problem.

Text of "A" Paper from the IEEE Power Engineering Society Winter Meeting, New York, New York, Jan. 25-30 1976.

Sabonnadiere, JC (INPG, Grenoble France); Nicolas, A  
Institute of Electrical and Electronics Engineers, (76-CH1075-1 PWR) Conf Paper Paper A-76-214-7, 1976, 8 pp

ACKNOWLEDGMENT: EI (EIX770200076)  
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11 152803

**FLOW-COORDINATED OPERATING STRATEGIES FOR AUTOMATED TRANSPORTATION SYSTEMS**

The main components of two alternative flow-coordinated strategies upon which an overall vehicle management problem might be based, are outlined. A fundamentally new approach to the vehicle management problem is presented which takes into account station capacity constraints and which is potentially applicable to large, topologically complicated systems operated at high vehicle density levels.

Presented at the 14th IEEE Conference on Decision Control, Including the Symposium on Adaptive Processes, held in Houston, Texas, 10-12

December 1975.

Kiselewich, SJ (Yale University); Tong, YM Morse, AS  
Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 553-558, 11 Ref.

ACKNOWLEDGMENT: EI (EIX770200095)  
ORDER FROM: ESL

11 152805

**CONTROL CONSIDERATIONS FOR AUTOMATED GUIDEWAY TRANSIT SYSTEMS**

The objective of the paper is to present a description of the various control functions necessary for the operation of advanced automated transit systems. These control functions are hierarchical in nature and range from scheduling and routing to control of velocity and spacing between individual vehicles. Proposed solutions to the various control problems which arise in advanced automated transit systems are discussed.

Presented at the 14th IEEE Conference on Decision Control, Including the Symposium on Adaptive Processes, held in Houston, Texas, 10-12 December 1975.

Garrard, WL (Minnesota University, Minneapolis); Caudill, RJ Reed, WB  
Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 576-572, 24 Ref.

ACKNOWLEDGMENT: EI (EIX770200097)  
ORDER FROM: ESL

11 152806

**MULTILAYER THEORY OF D.C. LINEAR BRAKES WITH SOLID-IRON SECONDARY**

A new theory for dc linear brakes with solid-iron secondary is proposed. Such brakes may be used to supplement the action of standard braking systems on conventional trains. The theory is based on 2-dimensional Fourier-series decomposition of the primary mmf, while the solid-iron secondary is notionally split into thin sheets of constant permeability, determined by an underrelaxed iterative procedure. The theoretical and test plots of braking force against speed show a fairly good agreement.

Boldea, I (Rome Polytechnical Institute, Italy); Babescu, M *Institution of Electrical Engineers, Proceedings* pp 220-222, 7 Ref.

ACKNOWLEDGMENT: EI (EIX770200098)  
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DOTL JC

11 153394

**RIDE CONTROL FOR HIGH-SPEED GROUND TRANSPORTATION INCLUDING PASSENGER-SEAT DYNAMICS AND ACTIVE AERODYNAMIC SUSPENSIONS**

The feasibility of controlling high speed ground transportation systems responses through the use of active suspension systems in the form of lifting surfaces is studied. Aerodynamically, three-dimensional canards are employed to control the pitch and plunge steady-state response of the vehicle and passengers to harmonic guideway excitations. In addition to the model of an air cushion vehicle, a man-seat model is also incorporated into the analysis. Vehicle and passenger response has been studied by assuming various control schemes and a parameter optimization technique. A second method to suppress acceleration levels of the vehicle via optimal control theory has also been investigated. Vehicle response at a speed of 300 miles per hour is compared with railway comfort criteria and the ISO riding comfort standards. Except for the actively controlled cases, all results indicate that an uncomfortable ride would result from the vehicle's response. The proposed actively controlled suspension provides a safe and comfortable passenger environment.

Nathoo, NS *High Speed Ground Transportation Journal* Vol. 10 No. 3, Sept. 1976, pp 297-315

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

11 153396

**FLYWHEEL BOOSTS ELECTRIC VEHICLE PERFORMANCE**  
Brief details of an experimental installation with unusual features.

*Automotive Engineer* Vol. 1 No. 7, Oct. 1976, p 38

ACKNOWLEDGMENT: British Railways

ORDER FROM: Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London SW1H 9JJ, England

11 153799

#### MAGNETICALLY LEVITATED VEHICLES

Two areas have been considered for magnetic levitation, namely, low speed systems for city centres and very high speed systems for inter-city vehicles. As far as high speed systems are concerned, serious work is limited to West Germany and Japan. In Germany, both types of magnetic suspensions are being examined with speeds up to 400 km/h already being achieved. In Japan a two part vehicle and approximately 400 metres of track exist at the Japanese Railway Research Centre, the suspension of this vehicle being the high field super-conducting magnet. No nation has yet built a high speed magnetically suspended operational system. Difficulties do exist in identifying the need and raising the capital for investment. Furthermore, in spite of the many advantages claimed for the very high speed non-contact suspension over wheels, the wheel continues to serve and at speeds which at one time were considered only possible for magnetic levitation. In the low speed case, the technology has been devoted almost entirely to the attraction magnetic levitation system and a small vehicle capable of giving a high quality ride on relatively low grade track with a single stage suspension has been developed and built by the British Rail R&D Division. Although demonstration vehicles exist, nowhere in the world is there a fully operational system.

Summary of a paper with same title delivered by D.J. Dobbs (British Railways) at the Institution of Mechanical Engineers Railway Division Midlands Centre, 21 October 1976.

*Railway Engineer* Vol. 2 No. 2, Mar. 1977, pp 49-51

ACKNOWLEDGMENT: Railway Engineer

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

DOTL JC

11 154545

#### SECONDARY LIFT FOR MAGNETICALLY LEVITATED VEHICLES

A high-speed terrestrial vehicle is described that is magnetically levitated by means of magnets which are used to induce eddy currents in a continuous electrically conductive nonferromagnetic track to produce magnetic images that repel the inducing magnet to provide primary lift for the vehicle. The magnets are arranged so that adjacent ones have their fields in opposite directions and the magnets are spaced apart a distance that provides a secondary lift between each magnet and the adjacent magnet image, the secondary lift being maximized by optimal spacing of the magnets. (ERA citation 02:010295)

This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of patent available Commissioner of Patents, Washington, D.C. 20231 \$0.50.

Cooper, RK

Federal Energy Administration Patent PAT-APPL-509-972, No Date, 8 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PATENT-3951074, DOTL NTIS

11 155351

#### VEHICLE-FOLLOWER CONTROLS FOR SHORT HEADWAY AGT SYSTEMS- FUNCTIONAL ANALYSIS AND CONCEPTUAL DESIGNS

Vehicle following is a technique for the longitudinal control of vehicles in an automated transit system where the speed and spacing of a given vehicle are governed by the behavior of its predecessor on the guideway. Vehicle-follower control at very short headways (0.4 to 3 s) may be achieved by introducing a variable-gain capability. The approach can entail two modes of operation: velocity-command (open-loop) control and regulation (closed-loop) control. Conventional vehicle-follower design is successfully applied in the regulation mode at short headways. However, significant problems can arise when transitions are attempted from velocity-command to regulation mode because of jerk and acceleration constraints for

ride-quality considerations. The report investigates the use of variable-gain techniques to resolve the transition problem.

Chiu, HY Stupp, GBJ Brown, SJJ

Johns Hopkins University, Laurel, Urban Mass Transportation Administration, (UMTA-MD-06-0018) 5Final Rpt APL/JHU-CP-051/TPR03, UMTA-MD-06-0018-76-4, Dec. 1976, 109 pp

Contract DOT-UT-30010

ACKNOWLEDGMENT: NTIS

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PB-266272/4ST, DOTL NTIS

11 156230

#### ECONOMIC ASPECTS OF APPLICATION OF SOLIDS-WATER TRANSPORTATION FOR COAL [Wirtschaftliche Aspekte fuer die Anwendbarkeit des Feststoff-Wassertransportes bei Steinkohle]

On the basis of practical examples and plant projects, the problems and preconditions of using this conveying system for the delivery of coal are compared with other transport systems. An analysis of the installation-and operating cost reveals that the layout of the starting-and terminating points are decisive for the profitability of hydraulic transportation. The parameters of the raw material and of the operating conditions of the pipeline system are examined with regard to their economic importance. It can be said that the profitability of hydraulic mineral-coal transportation depends on whether long-term contracts could be signed for transporting great quantities over long distances and whether additional ship-, railway-and road facilities are available. [German]

Koehling, R Leininger, D *Aufbereitungs-Technik* Vol. 17 No. 11, Nov. 1976, pp 574-579, 6 Ref.

ACKNOWLEDGMENT: EI (EIX770400055)

ORDER FROM: ESL

11 156235

#### POWER SUPPLY, TRAIN CONTROL

Tracked levitated vehicles, powered by linear synchronous motors, must have their positions located accurately. There is a very important relation between power supply and train control. This paper describes investigations of the cycloconverter applied for these purposes.

Fujimura, T Kataoka, N *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, 7 pp, 11 Fig.

ACKNOWLEDGMENT: Railway Technical Research Institute, Japan

ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

DOTL JC

11 156236

#### REPULSIVE LEVITATION AND PROPULSION

A magnetic-levitation vehicle to which linear synchronous motor and repulsive levitation are applied is described. The vehicle is equipped with superconductive magnets to obtain high flux density in the clearance gaps between body and guideway for high levitation and lateral clearance and for good efficiency. The principles and concepts, as well as the laboratory progress, are described.

Yamashita, H *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, pp 157-165, 11 Fig.

ACKNOWLEDGMENT: Railway Technical Research Institute, Japan

ORDER FROM: Japanese National Railways, Kunitachi, Box 9, Tokyo, Japan

DOTL JC

11 156237

#### DYNAMIC PROPERTY OF GUIDEWAY GIRDER

The theoretical investigation of the dynamic behavior of a girder under the passage of a high-speed vehicle is described. The rigidity and impact strength of a girder to carry a levitated vehicle at the Miyazaki test track are proposed.

Matsuura, A *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, pp 166-169, 10 Fig.

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

DOTL JC

**11 156238**  
**POWER SUPPLY AND CONTROL SYSTEM FOR RAILWAY BY LINEAR SYNCHRONOUS MOTOR TRACTION**

The power supply for a linear synchronous motor is closely related with train operation control. The author deals with one of the results of studies of power supply and control for an LSM traction system.

Saijo, T *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, pp 170-173, 7 Fig., 1 Tab., 1 Ref.

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

DOTL JC

**11 156239**  
**MOTION CHARACTERISTICS OF MAGNETICALLY LEVITATED VEHICLE**

The lateral roll motions of the magnetic-levitation test vehicle for the Miyazaki test track are investigated. There are three problems: (1) the effects of magnetic damping; (2) the effects of the height of the vehicle's center of gravity; (3) the effects of the guideway configuration. Center of gravity height and guideway design have greatest influence on the coupling of lateral and roll motions. If magnetic damping is large enough, small coupling is desirable; other facets of this problem are investigated also.

Miyamoto, M *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, pp 174-177, 7 Fig., 1 Tab.

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

DOTL JC

**11 156240**  
**CHARACTERISTICS OF SUPERCONDUCTING MAGNETIC SUSPENSION AND GUIDANCE ON LOOP TRACKS**

The characteristics of superconducting magnetic suspension and guidance systems for high speed vehicles on loop tracks are described, comparing theoretical results with experimental results obtained by rotating test devices and operating test vehicles driven by linear synchronous motors.

Iwahana, T *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, pp 178-181, 9 Fig., 2 Tab., 2 Ref.

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

DOTL JC

**11 156241**  
**MERGING CONTROL OF NEW FREIGHT TRANSPORTATION**

A tube transportation system for freight transport between major Japanese cities has been investigated. A merging control is indispensable in moving loaded vehicles into the high-speed flow on the main line. The development of merging control methods and experimental results of one-tenth scale tests and computer simulations are described. With information on wagon position, a merging controller can compute optimal acceleration of a merging vehicle and control the voltage to linear induction motors on the merging line.

Fujimori, S Takami, K Kozuka, T Matsumoto, K *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, pp 182-187, 13 Fig., 1 Tab.

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

DOTL JC

**11 156242**  
**DEVELOPMENT OF GUIDEWAY FOR LEVITATED GROUND TRANSPORTATION**

The development of the guideway for levitated ground transportation at the Railway Technical Research Institute is reviewed. General considerations on guideway development; the specifications for the guideway at the Miyazaki test track; and future design possibilities are discussed.

Morii, T *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 4, Dec. 1976, pp 145-150, 4 Fig., 2 Tab.

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

DOTL JC

**11 156884**  
**ANALYTICAL MODEL FOR GUIDEWAY SURFACE ROUGHNESS**

An analytical model is presented for calculating the power spectral density of relatively short wavelength guideway irregularities associated with surface roughness. The results are presented in terms of design tolerances which can be interpreted in terms of the familiar California profile index or in terms of measurable deviations from a straight edge. Digital computer numerical simulation techniques are used to verify the model.

Bala, KM (Texas University, Arlington); Hullender, DA *ASME Journal of Dynamic Systems, Meas and Control* Vol. 98 No. 3, Ser G, Dec. 1976, pp 425-431, 10 Ref.

ACKNOWLEDGMENT: EI (EIX770400307)  
ORDER FROM: ESL

DOTL JC

**11 156887**  
**RESEARCH AND DEVELOPMENT POSITION OF ELECTROMAGNETIC SUSPENSION TECHNOLOGY IN THE FEDERAL GERMAN REPUBLIC [Forschungs-und Entwicklungsstand der Elektromagnetischen Schwebetechnik in der Bundesrepublik Deutschland]**

The experimental vehicles and the test equipment brought into service to date include test rigs for stationary and rotational measurement of static and dynamic parameters as well as the detection of eddy currents. Performance tests on the experimental vehicles are reported, in which electromagnetic suspension technology is preferred to air cushion technology. The aims for the experimental vehicles are given as: V max = 400 km/h, 200 to 400 people working load, energy consumption in the region of comparable rail bound vehicles. Asynchronous short stator motors and synchronous long stator motors are compared. A comparison of the principal dimensions demonstrates the pronounced dependency of the actual power supplied on efficiency and phase displacement. /TRRL/ [German]

Winkle, G *Elektrotechnische Zeitschrift, Ausgabe A Analytic* Vol. 96 No. 9, 1975, pp 367-373, 3 Fig., 2 Tab., 9 Phot., 2 Ref.

ACKNOWLEDGMENT: Federal Institute of Road Research, West Germany (BAST48060E), TRRL (IRRD 304260)  
ORDER FROM: VDE Verlag GmbH, Bismarckstrasse 33, 1000 Berlin 12, West Germany

**11 156888**  
**THE EMS (ELECTRO MAGNETIC SUSPENSION) LOAD BEARING AND GUIDANCE SYSTEM FROM THE DYNAMIC VIEWPOINT [Das EMS-Trag-und Fuehrungssystem aus Dynamischer Sicht]**

The requirements for support and guidance in electro magnetic suspension technology (ems) such as contact-less adherence to the nominal trajectory, higher level of ride comfort, stability and lower energy demand are outlined. The method of working of the primary support and guidance equipment is illustrated on a control loop with suspended magnets, current supply, bogies, anchor rails, sensors (spacers) and governors. The construction of the suspension and guidance equipment is illustrated by examples. The secondary suspension (secondary springing with vibration insulation and roadway tracking) as well as emergency suspension and guidance equipment is described. /TRRL/ [German]



Guenther, CR Heym, KD Nave, PMW *Elektrotechnische Zeitschrift, Ausgabe A Analytic* Vol. 96 No. 9, 1975, pp 373-377, 6 Fig., 2 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-30426)

ORDER FROM: VDE Verlag GmbH, Bismarckstrasse 33, 1000 Berlin 12, West Germany

11 156889

**SECOND CONFERENCE ON ADVANCES IN MAGNETIC MATERIALS AND THEIR APPLICATIONS**

The following papers were presented at the conference on magnetic materials--an assessment of linear superconducting motors for maglev, Abel, E; Development of levitated vehicles with superconducting magnets, Albrecht, C; Forces on magnetically levitated vehicles above flat guideways--a modelling technique, Campbell, P; Suspension and guidance control system for a DC attraction maglev vehicle, Goodall, RM; Electrodynamic levitation of high speed vehicles, Howell, JP; passenger carrying vehicles using controlled DC and controlled permanent magnets, Jayawant, BV; Design and testing of a low speed magnetically suspended vehicle, Linder, D. /TRRL/

Institution of Electrical Engineers Monog Rpt. 1976, 165 pp, Figs., Tabs., Photos., Refs.

ACKNOWLEDGMENT: TRRL (IRRD-224924)

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11 156906

**FINITE MODE BOND GRAPH REPRESENTATION OF VEHICLE-GUIDEWAY INTERACTION PROBLEMS**

Bond graph representations are used to develop and interpret classical modal analysis techniques for the prediction of vehicle-guideway dynamics. The method can be generalized to multiple span guideways using any dynamic boundary conditions at support locations and nonlinear vehicle models can be used with any vehicle displacement-time history. The procedure is illustrated for a two-span Bernoulli-Euler Guideway with first-order dynamic boundary conditions. The ultimate applications are to high-speed ground transportation systems.

Margolis, D (California University, Davis) *Franklin Institute Journal* Vol. 302 No. 1, July 1976, pp 1-17, 11 Ref.

ACKNOWLEDGMENT: EI

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11 157240

**VEHICLE MANAGEMENT SYSTEMS FOR HIGH PERFORMANCE PERSONAL RAPID TRANSIT SYSTEMS**

The paper presents a class of vehicle dispatching policies predicated on the assumption that vehicle travel costs and passenger waiting costs can be related. The dispatching policies vary as the functions chosen to model passenger waiting costs vary. The computer execution time of each policy in family of policies is most reasonable and thus policies will handle systems with large demands. The dispatching policies are founded on the results of the two-station models also contained in this work. Two-station model has presented a major result for batch service queues--namely the presentation of the optimal policy for batch service queues with nonlinear customer waiting costs.

Weiss, HJ (Western Illinois University, Macomb) Northwestern University, Evanston Res. Rpt. Publication 1, 1976, 58 pp

ACKNOWLEDGMENT: EI

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11 157475

**USERS' OPINIONS OF PRT (CAB TRACK) SYSTEMS [Die Meinung der Benutzer ueber Kabinenbahnsystem]**

The Federal German Ministry for Research and Technology commissioned a study by the Hamburg Hochbahn AG, the object of which was to determine the suitability of the PRT (Kabinenbahn) and its acceptance by the public. Approximately 20 to 35% of the public are critical for various reasons. Further technical development is recommended. On the question of the introduction of large or small passenger "cabins" or carriages, further individual evaluations are necessary. /TRRL/ [German]

Tappert, H Henrich, K *Nahverkehrs-Praxis Analytic* Vol. 23 No. 2, 1975, pp 64-68, 2 Fig.

ACKNOWLEDGMENT: TRRL (IRRD-304243), Federal Institute of Road Research, West Germany

ORDER FROM: Ernst Arnold GmbH, Siegburgstrasse 5, Dortmund, West Germany

11 157490

**A COMPARATIVE COST/BENEFIT ASSESSMENT OF MINITRAM AND OTHER URBAN TRANSPORT SYSTEMS**

This report gives a summary account of a cost/benefit analysis of several hypothetical fixed track automatic passenger transport systems in an urban scenario based on the West Midlands. The assessment was carried out as part of the minitram project study and is mainly concerned with a system using 20 place minitrans, but other automatic systems studied for comparative purposes include a network cab system (Cabtrack) and minitram systems using larger vehicles. Comparative work was also done on a rail rapid transit system, trams, and express buses running on ordinary roads. The report includes a brief description of the methodology used, with particular reference to the problems of estimating modal split to a new mode when two or more existing modes are present. The main conclusion reached from the study was that a suitable minitram network is likely to produce enough cash revenue to cover its direct operating costs and to produce sufficient social benefit to give an internal rate of return of more than 10 per cent on its capital cost. However the capital cost of the infrastructure is too great for capital charges to be paid out of net revenue, and a substantial capital grant would be required as an initial subsidy. The report stresses the importance of selecting appropriate economic criteria for optimisation before a valid economic comparison can be made with other systems. /Author/TRRL/

Langdon, MG

Transport and Road Research Laboratory Lab. Rpt. LR-747, 1977, 30 pp, 6 Fig., 11 Tab., 14 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-225198)

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11 157511

**YEAR OF PROGRESS FOR JAPAN'S THREE MAGLEV PROJECTS**

With Japanese National Railways's 7-km maglev test track due to be completed and Japan Air Lines' High Speed Surface Transport (HSST) linear induction test car likely to attempt 300 km/h, the development outlook for magnetically levitated transport in Japan remains bright. Work on the Ministry of Transport-sponsored project for a small linear-motor powered vehicle for rapid transit use also continues.

*Railway Gazette International* Vol. 133 No. 6, June 1977, pp 232-233, Photos.

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DOTL JC

11 157538

**REPORT ON TESTS ON A PROTOTYPE LINEAR MOTOR WITH A U-SHAPED ARMATURE [Rapport des essais du prototype du moteur lineaire a induit en U]**

After describing the test installations and equipment, this report gives detailed results of electrical measurements for each separate winding on a 1000 hp asynchronous linear motor at 180 km/h, for a single-phase and three-phase current supply with a fixed frequency of 50 Hz, and the efficiency of this motor with different frequency drifts. [French]

Pascal, JP

Institute of Transport Research No. 17, Oct. 1976, 82 pp, 36 Fig., 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Institute of Transport Research, Avenue du General Mallet-Joinville, Boite Postale 28, 94 Arcueil, France

11 157575

**SEMPER CONTROL OF ASYNCHRONOUS LINEAR MOTORS FOR VEHICLE DRIVES [Geschwindigkeitssteuerung von Asynchronen Linearmotoren fuer Fahrzeugantriebe]**

A comparison between different control systems for asynchronous linear motors shows that frequency control offers advantages with regard to efficiency, reactive power consumption, motor construction and electric brake. Self-controlled inverters are suitable for the supply of the motor with variable frequency and voltage. As compared with rotating asynchronous machines, linear motors, due to their finite length, show differences in their operational behavior which result among other things in a strong speed dependence of the machine characteristics. Hence they require control rules differing from those usual for rotating asynchronous machines. Unilateral linear motors impose special requirements on the control because of their normal forces and their air gap dependent parameters. [German]

Appun, P Pouplier, A Reichel, W *Elektrische Bahnen* Vol. 47 No. 12, Dec. 1976, pp 275-281, 16 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

11 157588

**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 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 (Sheffield University, England); Hackam, R Benson, FA *Institute of Electrical and Electronics Engrs Proc* Vol. 64 No. 12, Dec. 1976, pp 1699-15, 68 Ref.

ACKNOWLEDGMENT: EI

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11 157713

**ROUTE ELEMENTS FOR HIGH-SPEED RAILWAYS WITH ELECTROMAGNETIC LEVITATION**

The route elements for high-speed railways with electromagnetic levitation (EMS) are described for ultimate speeds of 400 and 300 km/h and passenger and freight services on a common track, as based on the characteristics of contact-free running and traction. In addition to sinusoidal transition curves and ramps, standard radii of 4,400 m (2,500 mm) are important elements, the small size of which results from the 12 degrees superelevation possible with EMS vehicles. The maximum longitudinal gradient is 35%, the rounding out of the change in gradient is circular. Vertical and horizontal curves can coincide just as rounding out and transition curves. The aerodynamically necessary distance between track centres on the open line, the required tunnel cross-sections and the spaces to be kept free are stated. The most important standard cross-sections are the supports, the cutting and the tunnel, for which the dimensions are given. It is concluded that particularly because of the special characteristics of the contact-free EMS technique with the possible selection of the route elements such as radius of curvature, maximum longitudinal gradient and supports, the average route investment costs can be less than for conventional high-speed railway routes. The article discusses the results of research and development projects which have been assisted by the West German government. [German]

Zurek, R Molzer, P *Eisenbahntechnische Rundschau* Vol. 26 No. 4, Apr. 1977, 9 pp

ACKNOWLEDGMENT: British Railways

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

DOTL JC

11 157714

**SAFETY AND EMERGENCY SYSTEMS FOR ROUTE-GUIDED HIGH-CAPACITY HIGH SPEED TRAINS WITH CONTACT-FREE SUPPORT**

The Federal Ministry for Research and Technology has given MAN a development contract for a safety and emergency system for future high-capacity high-speed trains so that the vehicles can be brought safely to a halt without hazard for the passengers if there is a failure in the power supply or in the support and guidance system. The author describes the preliminary theoretical studies, the detailed initial tests and material investigations as well as the computer calculations. The results of the running tests with the emergency component test carriage developed from these studies were to the full satisfaction of the experts. The report is fully documented with illustrations and test records. [German]

Hamann, L *Eisenbahntechnische Rundschau* Vol. 26 No. 3, Mar. 1977, pp 163-166

ACKNOWLEDGMENT: British Railways

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

DOTL JC

11 157903

**ADVANCED GROUND TRANSPORT ON THE MOVE AGAIN?**

Two recent developments in this field are briefly reported, both using single-sided linear motors for propulsion. In Canada, a contract with Canadair is reported to complete the development of an intermediate capacity transit system (ICTS) with two-car units running on steel wheels, and without magnetic suspension. The Toronto firm of spar are to provide the propulsion system which includes a self-steering bogey and wheel assembly for the car, and provision is made for fully automatic control. A test track facility about 2 km long is to be built at Kingston, Ontario. In Japan, Japanese Air Lines (JAL) have accepted responsibility for the provision of a rapid transit link between Tokyo and the new international airport 40 miles away at Narita. A prototype vehicle is described as being in the building phase. It is expected to reach 125 mile/h, and financial support is being sought for the construction of a \$600 million track and system. The final vehicle is envisaged as 72 ft long, 12 ft wide and 10 ft high to carry 112 passengers at 190 mile/h, riding on a magnetic cushion produced by 8 electromagnets. /TRRL/

*New Scientist* Analytic Vol. 73 No. 1034, Jan. 1977, p 80, 1 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 224578)

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DOTL JC

11 157946

**OUTLOOK OF PNEUMATIC PIPELINES**

The general characteristics of the system, the basic technology involved, an analysis of investment and operating costs are discussed; a model is used to compare unit costs with those of rail transport.

Included in Conference Papers on Advance Freight System Technology: "America's Freight System in the 80's and 90's---But How To Get There?", RRIS 21 144087 7701. See also Conference Proceedings, RRIS 20 157227 7702.

Soo, SL Leung, ST

Transportation Systems Center Conf Paper Dec. 1976, pp 107-118, 2 Fig., 12 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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11 157967

**PROPULSION REQUIREMENTS FOR HIGH-SPEED VEHICLES WITH ELECTRODYNAMIC SUSPENSION**

The thrust force and power requirements for the propulsion of a vehicle with electrodynamic suspension (i.e. using superconducting magnets) are discussed. Acceleration thrust, magnetic drag, and aerodynamic drag are

shown to lead to calculated power requirements of 8.0 MW under acceleration, and 5.2 MW for cruising at 300 mi/h. Aerodynamic and magnetic drag forces together produce acceptable passive deceleration characteristics. Propulsion requirements under normal operation and in emergency situations (i.e., unscheduled stops) are described. Propulsion systems are discussed, and it is concluded that the linear synchronous motor is most suitable for the proposed Maglev vehicle.

Originally presented at the 9th IEEE/IAS Annual Meeting, Pittsburgh, Pa., 1974.

Atherton, DL. Eastham, AR (Canadian Institute of Guided Ground Transport) *Institute of Petroleum, Journal of* Vol. IA13 No. 3, May 1977, pp 268-273, 8 Fig., 3 Tab., 7 Ref.

ACKNOWLEDGMENT: IEEE  
ORDER FROM: ESL

DOTL JC

#### 11 158186 MAGNETICALLY SUSPENDED VEHICLES FOR URBAN TRANSPORT SYSTEMS

The article describes the University of Sussex's vehicle designed to carry passengers.

Jayawant, BV *Electronics and Power* Vol. 23 No. 3, Mar. 1977, 4 pp, 6 Fig.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

#### 11 158187 IRON-CORED LINEAR SYNCHRONOUS MACHINES

Advanced forms of ground transport are the subject of much current research. Linear electrical machines are of interest as the propulsion method for the advanced systems. Iron-cored versions only are considered in this article.

Eastham, JF *Electronics and Power* Vol. 23 No. 3, Mar. 1977, 4 pp, 6 Fig.

ACKNOWLEDGMENT: British Railways  
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#### 11 158202 SUPERCONDUCTING LINEAR SYNCHRONOUS MOTOR PROPULSION AND MAGNETIC LEVITATION FOR HIGH SPEED GUIDED GROUND TRANSPORTATION. PHASE III INTERIM REPORT

After the commissioning of a six-component force balance and adjustment system, the wheel facility (7.6 m diameter, 0-100 km/h) was used for a large-scale linear synchronous motor test program. Rim-mounted "stator" windings, energized from a 42 kVA inverter, interacted with a stationary superconducting magnet. The measured forces, their harmonics, and terminal characteristics agree well with analysis based on mutual inductance computations and a coupled circuit model. The LSM is underdamped under open loop conditions, and closed loop stability has been demonstrated both by internal inverter power factor angle control and by the use of "vehicle" position detectors. Control strategies are being examined by computer modelling of LSM dynamics, and are being implemented in a small-scale LSM test track. Analysis of ladder levitation guideways shows that a pure inductive model yields useful results at cruising speed, while a more rigorous resistive-inductive model must be used at lower speeds. Good lift/drag ratios with low force pulsations are possible. A scalar potential approach has been developed to determine the eddy current distribution and force on a magnet moving at high speed over a conducting guideway. Analysis of the dynamics of the strip levitation system shows that, while appreciable damping is evident at low speed, all modes are highly underdamped at cruising speed. A similar conclusion is reached for the null-flux loop guidance scheme. A secondary suspension has been incorporated into the reference design. High damping factors can be achieved with a novel passive secondary magnetic damping scheme. Small perturbation analysis shows that the appropriate location of springs and dampers in the secondary suspension leads to dynamic stability with reasonable ride quality. Supplementary active control through hydraulic actuators is being considered. Analysis of isochoric operation of the superconducting magnets has been extended to abnormal heat leaks. Overpressure relief valves, venting at 20 Atm, are proposed. An interim reference design describes the proposed Maglev vehicle design and the characteristics of its sub-systems.

Sponsored by the Transportation Research & Development Center,

Canada.

Eastham, AR (Canadian Maglev Group)

Canadian Institute of Guided Ground Transport, (Project D.71.72) Intrm Rpt. CIGGT-76-7, 1960, 280 pp, Figs., Tabs., 26 Ref., 6 App.

Contract OST5-0112

ACKNOWLEDGMENT: CIGGT  
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DOTL RP

#### 11 159476 COAL SLURRY PIPELINES AND NATIONAL TRANSPORTATION POLICY: A CRITICAL REVIEW

Transportation of coal slurry by pipeline is a relatively new technology, and the author describes several proposals now being promoted in the USA by which to employ that means to move huge volumes of coal in some instances more than 25 million tons per year distances of a thousand miles or more. Reference is made to legislation which, over the last two years, has been considered in the United States Congress and in certain states by which to grant the power of eminent domain to coal slurry pipelines. Eminent domain is described as the power to condemn, to take an individual's property without his consent, subject to the obligation to pay its fair market value. This paper considers the nature of eminent domain in terms of slurry line operations with reference to the transportation of energy fuels in general and the effects of such operations on natural and economic environments. For example, slurry lines are quoted as being heavy users of water which is extremely scarce in the West. The economics of such operations are critically reviewed. It is considered that the proposal to grant slurry pipelines powers of eminent domain is by no means a simple plan to bring needed competition to the transportation of coal, and that on the contrary it raises a great many complex issues of profound importance to the nation. /TRRL/

Walker, JR *Logistics and Transportation Review Analytic* Vol. 12 No. 4, 1976, pp 261-271

ACKNOWLEDGMENT: TRRL (IRRD-225749)

ORDER FROM: Logistics and Transportation Review, Faculty of Commerce, British Columbia University, Vancouver V6T 1W5, British Columbia, Canada

#### 11 159477 SECOND REPORT FROM THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY: ADVANCED GROUND TRANSPORT, SESSION 1975-76, REPORT AND APPENDICES

The result of an inquiry held in 1973 by the Select Committee on Science and Technology of Session 1972-73 into the circumstances surrounding the termination of the work of Tracked Hovercraft Ltd (THL) is discussed, and a review presented of developments that followed the publication of the committee's report. The original objective of THL is described as to build a three mile full-scale test track and two research vehicles: one, on rubber tyres, to test linear motors, controls and current collection up to 150 mile/h, and the other to test non-contact suspension systems and linear motors up to 300 mile/h. The report of the Science Research Council (SRC) panel on advanced ground transport published in October 1975 is discussed in relation to proposals that had been presented by Imperial College concerning the future use of the THL facilities at Earith, Huntingdonshire, and to the proposal for the establishment of an SRC research institute based at Earith. Research needs are reviewed in respect of evidence provided by the Department of the Environment and the Department of Industry jointly, and prospects for advanced ground transport development presented for consideration. Conclusions and recommendations include proposals that the SRC should accept, in principle, proposals for the provision of a central research facility to focus and stimulate research and to improve the provision of trained manpower; and that the government should enter into immediate negotiations with European governments, in particular those of France and the Federal Republic of Germany, and with the commission of the EEC, aimed at the maximum possible pooling of national facilities for AGT research. [ENGLAND]

House of Commons Paper 592.

Her Majesty's Stationery Office Monog Rpt. HC Paper 592, July 1976, 61 pp, Refs.

ACKNOWLEDGMENT: TRRL (IRRD-225831)

ORDER FROM: Her Majesty's Stationery Office, P.O. Box 569, London SE1 9NH, England

11 159479

**VEHICLE MANAGEMENT POLICIES FOR AUTOMATED TRANSPORTATION SYSTEMS**

A new approach to the problem of managing vehicles within a personalized automated transportation system is outlined. Two alternative vehicle management strategies are suggested; each is potentially applicable to either scheduled or demand responsive systems possessing large numbers of vehicles, topologically complicated guideway networks and capacitated stations. The proposed strategies take station capacity constraints into account by guaranteeing that under normal operating conditions (i.e., no emergencies) no vehicle is ever prevented from entering its destination station because of the unavailability of a berth.

Presented at the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976. Also available from ESL.

Kiselewich, SJ (Yale University); Tong, YM Morse, AS  
International Federation of Automatic Control Conf Paper 1976, pp 223-227, 12 Ref.

ACKNOWLEDGMENT: 18 EIMFEngineering Index (EIX770400463)  
ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

11 159481

**CONTROL OF A LINEAR SYNCHRONOUS MOTOR FOR MAGNETICALLY LEVITATED VEHICLES**

The paper discusses a control system for such motors, which is a propulsion system favored for the next stage of the German electro-dynamically-levitated train project. Feedback signals of vehicle position and levitation height must be available in the wayside power converters. A novel vehicle position detector is described in which these signals are calculated from electrical data measured at the stator winding terminals. An electrical model of the motor is used in conjunction with a phase-locked loop to obtain the signals of vehicle position required by the control system.

Presented at the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976. Also available from ESL.

Gibson, J (Siemens, West Germany); Holtz, J Linqaya, S  
International Federation of Automatic Control Conf Paper 1976, pp 143-152

ACKNOWLEDGMENT: EI (EIX770400457)  
ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

12 090462

**RISK ANALYSIS IN HAZARDOUS MATERIALS  
TRANSPORTATION: A MECHANISM FOR INTERFACING THE  
RISK ANALYSIS MODEL WITH THE HAZARDOUS  
MATERIALS INCIDENT REPORTING SYSTEMS**

An experimental integrated risk analysis system has been developed for the U.S. Department of Transportation, Office of Hazardous Materials. This system automates the efficient combination of (1) an historical data base, provided primarily by the Hazardous Materials Incident Reporting System, of reports of incidents occurring in the transportation of hazardous materials, with (2) a risk analysis model that employs the data from these reports to generate statistical predictions of expected losses due to possible accidents with shipment of any particular material in a particular mode and container(s). The predictions can then be used in comparative risk evaluations that can support regulatory decision making. The present report describes the risk analysis system in detail, discusses its advantages and present shortcomings, due principally to limitations of its existing data base, and provides recommendations for improvements through future system modifications.

Philipson, LL  
University of Southern California, Department of Transportation Final  
Rpt. RAPO-74-604, Sept. 1974, 145 pp

Contract DOT-OS-20114

ACKNOWLEDGMENT: NTIS  
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PB-239859/2SL, DOTL NTIS

12 099185

**SAFETY PRIORITIES IN RAIL RAPID TRANSIT. VOLUME  
2-EXHIBITS**

This report contains the exhibits of the Volume 1 report, a report which develops a program to identify what should be done to aid in assuring that rail rapid transit safety continues to produce the lowest number of fatalities of any of the major passenger transportation modes. Exhibits are: (1) Work Statement; (2) Project Implementation Plan; (3) Safety Advisory Board; (4 & 5) Safety Advisory Board Meeting Agendas and Minutes; (6) Safety Advisory Board Committee Meeting Minutes; (7) Montreal Fire Report; (8) Compilation of Safety Related Items; (9) Accident Source Items Final Listing; (10) TDC Monograph Series 500 "Transit Flammability Requirements" 500-3; (11) UITP-Combustibility of Material Used in the Construction of Modern Rolling Stock; (12) Work Statement on Non-metallic Materials; (13) Consultants Report on Fire Safety of Materials; (14) Engineering for Fire Safety of Rail Rapid Mass Transit Systems-SRI; (15) TDC Monograph Series 500 "Smokeless Cable" 500-2; (16) NASA Problem Statement No. 72-04-025 Smokeless Non-toxic Cable; (17) Fire Extinguishing System-8-74; (18) Work Statement The Development of a Method and Equipment for Early Detection of Fire, etc; (19) a proposed Study of Accidents on Fixed Stairs in Rapid Transit Stations-E. Novell; (20) Proposed Work Statement "Design, Test and Acceptance Criteria for Transparencies; (21) Work Statement for the Production and Distribution of a Safety Film on Mass Transit; and 6 other exhibits with relevancy to the main report.

Sponsorship was by the Urban Mass Transportation Administration, DOT. See also Safety Priorities in Rail Rapid Transit. Volume 1-Report. Paper copy also available in set of 2 reports as PB-242952/SET.

Connell, WM  
Transit Development Corporation, Incorporated, Urban Mass  
Transportation Administration, (UMTA-DC-06-0091) Final Rpt.  
UMTA-DC-06-0091-75-2, Mar. 1975, 280 pp

ACKNOWLEDGMENT: UMTA, NTIS  
ORDER FROM: NTIS

PB-242954, DOTL NTIS

12 143764

**RAILROAD ACCIDENT REPORT: COLLISION OF PENN  
CENTRAL TRANSPORTATION COMPANY OPERATED  
PASSENGER TRAINS NUMBERS 132, 944, AND 939 NEAR  
WILMINGTON, DELAWARE, OCTOBER 17, 1975**

On October 17, 1975, about 6:37 p.m., a northbound Penn Central Transportation Company (Penn Central) passenger train, No. 944, struck

the rear of Penn Central passenger train No. 132, which had made an unscheduled stop near Wilmington, Delaware, because of an equipment malfunction. Train No. 939, a southbound Penn Central passenger train that was approaching on an adjacent track, struck the derailed equipment from No. 944. The collisions injured 25 persons and caused property damage of \$817,866. The National Transportation Safety Board determines that the probable cause of the rear end collision was the engineer's failure to operate his train according to established procedures. Contributing to the accident was the operational practice of the railroad industry which permits trains to enter occupied blocks. The second collision was caused by the absence of flagging.

National Transportation Safety Board NTSB-RAR-76-7, June 1976, 23  
pp

ACKNOWLEDGMENT: NTIS  
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PB-255652/2ST, DOTL NTIS

12 143798

**RAILROAD ACCIDENT REPORT: DERAILMENT OF AMTRAK  
TRAIN ON LOUISVILLE AND NASHVILLE RAILROAD,  
PULASKI, TENNESSEE, OCTOBER 1, 1975**

About 12:50 p.m. on October 1, 1975, 1 locomotive unit and 11 cars of Amtrak train No. 315 derailed on the Louisville and Nashville Railroad Company's track near Pulaski, Tennessee. Of the 69 persons on the train, 31 were injured. Property and equipment damage amounted to about \$1,067,000. The National Transportation Safety Board determines that the probable cause of this accident was the overturning of the outside rail in a 3 degree 8 min curve by high lateral forces induced by the six-wheel truck of the SDP-40-F locomotive; these forces exceeded the capability of the track which met current FRA standards. The speed of the locomotive, although not greater than the speed allowable for Class 4 track, was too great to be sustained by the track.

National Transportation Safety Board NTSB-RAR-76-6, May 1976, 35  
pp

ACKNOWLEDGMENT: NTIS  
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12 143802

**RAILROAD/HIGHWAY ACCIDENT REPORT: COLLISION OF A  
CROWN-TRYGG CONSTRUCTION COMPANY TRUCK WITH AN  
AMTRAK PASSENGER TRAIN, ELMWOOD, ILLINOIS,  
NOVEMBER 19, 1973**

At 9:10 a.m., c.s.t., on November 19, 1975, Amtrak turboliner passenger train No. 301 was struck by a loaded dump truck on a grade crossing in Elwood, Illinois. The crossing was unprotected and had limited sight clearance between the road and the track. Four cars of the five-car train were derailed and 41 persons were injured. The train was owned by Amtrak and was operated by an Illinois Central Gulf Railroad (ICG) crew over the ICG track. The road was a county highway maintained by the Will County Highway Department. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the truckdriver to stop his vehicle short of the track until it was safe to proceed. Contributing to the accident was the inadequate sight clearance between the road and the track on the approach to the unprotected grade crossing.

National Transportation Safety Board NTSB-RHR-76-2, May 1976, 26  
pp

ACKNOWLEDGMENT: NTIS  
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PB-254808/9ST, DOTL NTIS

12 146295

**DEVELOPMENT OF A MOBILE TREATMENT SYSTEM FOR  
HANDLING SPILLED HAZARDOUS MATERIALS [Final rept]**

This report documents the results of a laboratory test program undertaken to define the treatment processes for the development of a modular transportable treatment unit for an on-site handling of spilled hazardous materials in aqueous solutions. The hazardous materials evaluated during this study were selected based on the priority ranking system developed by EPA. Nine materials evaluated for treatment by chemical reaction, clarifica-

tion and activated carbon adsorption were: acetone cyanohydrin, acrylonitrile, ammonia, chlorinated hydrocarbons, chlorine, methanol, phenol, tetraethyllead (TEL) and tetramethyllead (TML). Several additional materials listed in the report were evaluated for treatment feasibility by reverse osmosis. The results of the laboratory tests indicated that the unit treatment processes of chemical reaction, flocculation, sedimentation, granular media filtration and activated carbon adsorption would form the most suitable and versatile system for an on-site removal and treatment of hazardous materials. This treatment vehicle is now ready and available for response to an actual or test spill.

Gupta, MK

Envirex, Incorporated, Environmental Protection Agency, (EPA-ROAP-21AVN-021) Final Rpt. EPA/600/2-76-109, July 1976, 86 pp

Contract EPA-68-01-0099

ACKNOWLEDGMENT: NTIS

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PB-256707/1ST, DOTL NTIS

12 148581

#### A SOLUTION TO TRAIN FIRES

In the wake of a disastrous tunnel fire in 1972, Japanese National Railways undertook actual train fire tests, first on open line and then in a tunnel. Extensive instrumentation was installed on the car in which fire was ignited and in the adjacent cars. Determined were relation between train speed and fire conditions, difference between ordinary and fire-resistant cars and the conditions existing in cars adjacent to the car on fire. It has been concluded that even a substantial fire on a train running in a tunnel can be countered by evacuating passengers to other cars, continuing to operate until the train is in the open, but that other problems remain to be solved.

Tanaka, T (Japanese National Railways) *Japanese Railway Engineering* Vol. 16 No. 1, 1975, pp 4-6, 2 Fig., 2 Tab., 1 Phot.

ORDER FROM: ESL

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12 148601

#### FATAL ELECTRIC ACCIDENTS AND GROUPS OF WORKERS CONCERNED [Toedliche elektrische Unfaelle und betroffene Berufsgruppen]

No Abstract. [German]

Hoesl, A *Elektrotechnische Zeitschrift, Ausgabe B* Vol. 28 No. 6/7, 1976, pp 166-168, 4 Fig., 2 Tab., 1 Ref.

ACKNOWLEDGMENT: UIC

ORDER FROM: ESL

12 148808

#### A REVIEW OF THE DEPARTMENT OF TRANSPORTATION (DOT) REGULATIONS FOR TRANSPORTATION OF RADIOACTIVE MATERIALS

No Abstract.

Department of Transportation TD 1.2:R 11, 1976, 44 pp, Figs., Refs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications (76-9685)

ORDER FROM: DOT

DOTL

12 148823

#### THE DISTRIBUTION OF DANGEROUS SUBSTANCES

The move towards international safeguards during the transport of hazardous materials is discussed. The author describes and analyses the various safeguards controlling the transport by road, rail, air and sea, and the various steps being taken at national and international levels to improve and harmonize existing practices and regulations.

Meadowcroft, AE *Occupational Safety and Health* Vol. 6 No. 10, Oct. 1976, pp 16-19

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Royal Society for the Prevention of Accidents, 52 Grosvenor Gardens, London SW1, England

12 150401

#### SMOKE AND TOXICITY HAZARDS OF PLASTICS IN FIRES

Plastics are now used widely in a variety of applications both within the general structure of buildings and in furnishings and fittings and there is concern that the widespread use of these materials may increase the fire hazard because of the possible production of large amounts of smoke and toxic gases. Smoke and toxic gases are generated in a number of different ways in fires, involving particularly the thermal and thermal oxidative decomposition of the polymeric material and the gas phase pyrolysis or combustion of volatiles. In some instances these routes can also lead to destruction of smoke and gases. The problems of smoke and toxicity hazards are being studied at the Fire Research Station, Borehamwood, using laboratory decomposition techniques with gas chromatography and mass spectrometry, and fire tests in a full scale compartment-corridor facility. Animal experiments carried out under contract provide the link between the analytical results and the physiological response of fire gases.

Woolley, WD Raftery, MM *Journal of Hazardous Materials* Vol. 1 No. 3, Nov. 1976, pp 215-222

ACKNOWLEDGMENT: British Railways

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12 150402

#### FIGURES AS A POINTER TO SAFETY

Railways have the duty to conduct their operations safely; the recording of railway accidents and the investigation of their causes have therefore always played an important role. Thorough investigation of the causes of accidents, however, suffered for a long time from the circumstance that the extent of the recorded accidents had to remain relatively limited. It was only with the aid of EDP that it became possible with economic justification to include the great mass of minor cases in the statistics, and thus to obtain greater informative value from the available statistics, to pursue more intensive research into the causes of accidents, and to take more effective counter-measures. The article deals with the extent, content and information value of the statistics on dangerous occurrences in railway working maintained by the DB since January 1, 1974. [German]

Gold, H *Eisenbahntechnische Rundschau* Vol. 25 No. 11, Nov. 1976, pp 692-698

ACKNOWLEDGMENT: British Railways

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

DOTL JC

12 150404

#### RECENT DEVELOPMENTS IN THE TRANSPORT OF LIQUID WASTES

The national hazardous waste problem and the unavoidable need to transport liquid wastes for off-site disposal are described. Practical measures for the avoidance of hazards during transportation are given, including: accurate waste description, correct vehicle design and selection, vehicle marking, effective technical control and emergency procedures. Practical case studies are presented describing incidents that have arisen and the conclusions to be drawn from them.

Davies, DR Mackay, GA *Journal of Hazardous Materials* Vol. 1 No. 3, Nov. 1976, pp 119-214

ACKNOWLEDGMENT: British Railways

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12 150530

#### A SUMMARY OF HAZARDOUS SUBSTANCE CLASSIFICATION SYSTEMS

This paper describes the criteria used by 23 systems to define a hazardous substance, primarily for regulatory purposes.

Kohan, AM

Environmental Protection Agency EPA/530/SW-171, 1975, 61 pp

ACKNOWLEDGMENT: NTIS

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PB-261086/3ST, DOTL NTIS

12 151169

**TRANSPORTATION SYSTEM SAFETY METHODOLOGY**

The Transportation System Safety Methodology is comprised of two major sections—a management section and a Transportation System Safety Program. The Management portion describes the ideal philosophy and attitude of safety management, and provides guidelines for appropriate organization and staffing of safety activities within the parent organization, and for policy and objective development, selection, training, certification and motivation of personnel, data base requirements, assignment of accountability, and measuring program effectiveness. The Program section provides a description of the hazard identification and analysis, and investigation and review processes, and introduces the techniques to be used in Safety Analysis. These analytical methods are discussed in their application to each phase of the transportation activity cycle: concept formulation, preliminary design, engineering design, production, and operation and maintenance, providing specific guidelines to the transportation system safety process in any given modal organization.

Horodniceanu, M Cantilli, EJ Shooman, M Pignataro, LJ  
Polytechnic Institute of New York, Department of Transportation Final Rpt. TR-76-505, DOT/TST-77/17, Nov. 1976, 147 pp

Contract DOT-OS-50241

ACKNOWLEDGMENT: NTIS  
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PB-262793/3ST, DOTL NTIS

12 151334

**RISK-BENEFIT METHODOLOGY AND APPLICATION: SOME PAPERS PRESENTED AT THE ENGINEERING FOUNDATION WORKSHOP, HELD AT ASILOMAR, CALIFORNIA ON SEPTEMBER 22-26, 1975**

The goal of this workshop is to assess quantitatively the state-of-the-art on risk/benefit methodology. Two new large technology areas are considered: (1) nuclear reactors; and (2) shipment and storage of liquefied natural gas. Both of these technologies can provide large consequence incidents should there be failures in the engineering of these systems. A general consensus at the workshop perceives methods of analysis for evaluating risks as being reasonably stable. Decision-or event-tree techniques, fault-tree techniques, or failure-mode and effects analysis are available. Any one or combinations of these techniques could be used to lead to relevant and quantitative results. With each method, existing and future data for such large consequence events are rather sparse, and it may have to be inferred partially from other industries. These tools developed for risk assessment and benefit assessment can help to determine the value to society or relevant subgroups of a given enterprise.

Okrent, D  
California University, Los Angeles, National Science Foundation Proceeding UCLA-ENG-7598, NSF/RA/X-75-029, Dec. 1975, 636 pp

Grant NSF-GI-39416,

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261920/3ST, DOTL NTIS

12 151337

**HISTORICAL PERSPECTIVES ON RISK FOR LARGE-SCALE TECHNOLOGICAL SYSTEMS**

An empirical study of historical trends in the risks sustained by participating populations for various large-scale technological systems is presented. Results are reported for three system categorizations: Natural Hazards, Man-Made Hazards, and Occupational Hazards. A new model for risk assessment is introduced that avoids the problems associated with assessing the value of a human life in risk-benefit decision making. The model treats risk terms of loss of life expectancy.

Baldewicz, W Haddock, G lee, Y Whitley, R Denny, V  
California University, Los Angeles, National Science Foundation UCLA-ENG-7485, NSF/RA/X-74/048, Nov. 1974, 173 pp

Grant NSF-GI-39416

ACKNOWLEDGMENT: NTIS  
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PB-261865/OST, DOTL NTIS

12 153082

**VANDALISM SUPPRESSION BY HELICOPTER. THE EFFECTIVENESS OF THE 1974 PROGRAM IN SEPTA AREA ON PENN CENTRAL AND READING COMMUTER LINES**

This is a report of the third year of use of a helicopter by the Southeastern Pennsylvania Transportation Authority for suppressing vandalism and improving safety on the region's 13 commuter lines. SEPTA funded the program. By the end of the program, 46 percent fewer injuries were experienced by riders of SEPTA commuter trains, a large number of trespassers were ejected from railroad property, damage to switches and signals was down 35 percent and track obstructions had been cut by 19 percent. There was also a reduction in stealing from freight cars.

The Vandalism Suppression Program was also financed in part by the Pennsylvania DOT (Project/Grant T-198), the City of Philadelphia, and the Counties of Bucks, Chester, Delaware, and Montgomery.

Southeastern Pennsylvania Transportation Authority 1975, 44 pp, Tabs., Photos., 10 App.

ACKNOWLEDGMENT: Southeastern Pennsylvania Transportation Authority  
ORDER FROM: Southeastern Pennsylvania Transportation Authority, 2028 PSFS Building, 12 South 12th Street, Philadelphia, Pennsylvania, 19107  
DOTL RP

12 153273

**SYSTEM SAFETY/RISK ANALYSIS TECHNIQUES APPLIED TO MOTOR VEHICLES AND RAPID TRANSIT SYSTEMS**

Since 1969 Booz, Allen & Hamilton Inc. has performed safety analyses of a number of ground transportation systems. The analyses were directed at the automobile, the transit bus, and the rail rapid transit system. Fault tree analysis techniques were used in all three cases. This paper discusses the utility of fault tree analysis techniques in setting safety requirements and goals for new equipment designers and system managers. The prioritization of safety requirements and goals was obtained through effects or cost benefit analyses and was an integral part of the fault tree analysis technique. The safety analysis of the automobile was confined to component degradation as a causation factor in automobile accidents. The transit us safety work analyzed over 92 types of accidents, both onboard and offboard. Two major outputs were derived from the safety analysis of rail rapid transit systems; these were safety criteria and a system safety program plan for the future design and development of such systems. In all three transit modes the analytical methodology, results, and conclusions are presented. /Author/

Mayteyka, JA (Booz-Allen and Hamilton, Incorporated); Talley, J  
*Journal of Safety Research* Vol. 9 No. 1, Mar. 1977, pp 2-14, 5 Fig., 2 Tab., 9 Ref.

ACKNOWLEDGMENT: National Safety Council, Safety Research Info Serv (SRIS-770201)

ORDER FROM: ESL

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12 153403

**RAILWAY ACCIDENTS 1975**

"Report to the Secretary of State for Transport on the safety record of the railways in Great Britain during the year 1975."

Department of Transport, England 1977, 102 pp

ACKNOWLEDGMENT: British Railways

ORDER FROM: Her Majesty's Stationery Office, 49 High Holborn, London WC1V 6HB, England

12 154000

**TOXICOLOGICAL AND SKIN CORROSION TESTING OF SELECTED HAZARDOUS MATERIALS**

Animal tests were performed using selected substances to determine if they qualified as hazardous materials according to the Department of Transportation Hazardous Materials Regulations. Overall toxicological and skin corrosion test results are summarized. The actual test data and details of the test methods used are also included. The general testing protocols followed in these determinations were those discussed in Publication 1138 of the National Academy of Sciences, National Research Council (1964) title, "The Principles and Procedures for Evaluating the Toxicity of Household Substances." The number of test animals used in each experiment was required to be sufficient to give a statistically significant result and to be in conformity with good pharmacological practice.



Harton, EEJ Rawl, RR  
United States Testing Company, Incorporated, Department of Transportation  
Final Rpt. DOT/MTB/OHMO-76/2, Apr. 1976, 32 pp

Contract DOT-OS-30077

ACKNOWLEDGMENT: NTIS  
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PB-264975/4ST, DOTL NTIS

12 154076

**RADIOACTIVE MATERIALS TRANSPORT EXPERIENCE**

This paper presents a brief review of the kinds of packaging suitable for different types of waste, the roles of highway and rail transport, restrictions imposed by political entities and carriers, and safety. The U. S. accident record is described, with some statistics given. (ERA citation 02:012509)

International symposium on management of waste from the LWR fuel cycle, Denver, Colorado, July 11, 1976. Microfiche copies only.

Langhaar, JW

Du Pont de Nemours (EI) and Company, Incorporated, Energy  
Research and Development Administration CONF-760701-2, 1976, 13 pp

Contract AT(07-2)-1

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

DP-MS-76-48, DOTL NTIS

12 154077

**NUCLEAR WASTE MANAGEMENT AND TRANSPORTATION  
QUARTERLY PROGRESS REPORT, APRIL-JUNE 1976**

Status of the following programs is reported: Alternative waste management systems; decontamination and densification of chop-leach cladding residues; disposition of retired contaminated facilities at Hanford; transportation safety studies; transport problems, 1976-2000; safety and economic study of special trains; and development of high-level waste shipping cask models. (ERA citation 02:012519)

Platt, AM

Battelle Memorial Institute/Pacific Northwest Labs, Energy Research  
and Development Administration Oct. 1976, 37 pp

Contract E(45-1)-1830

ACKNOWLEDGMENT: NTIS  
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BNWL-2126, DOTL NTIS

12 154552

**NUCLEAR WASTE MANAGEMENT AND TRANSPORTATION  
QUARTERLY PROGRESS REPORT, JANUARY-MARCH 1976**

Progress is reported in the following areas: Alternative waste management systems; decontamination and densification of chop-leach cladding residues; tritium separation and fixation; disposition of retired contaminated facilities at Hanford; transportation safety studies; transport problems, 1976-2000; safety and economic study of special trains; and development of high-level waste shipping cask models. (ERA citation 02:009240)

Platt, AM

Battelle Memorial Institute/Pacific Northwest Labs, Energy Research  
and Development Administration June 1976, 62 pp

Contract E(45-1)-1830

ACKNOWLEDGMENT: NTIS  
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BNWL-2029 DOTL NTIS

12 156234

**BEHAVIOR OF A FIRE ON A RUNNING TRAIN--FROM THE  
TRAIN FIRE TEST AT KARIKACHI TEST TRACK**

To prevent fires on rolling stock and in fixed facilities and to establish safety measures for passengers in the event of a train fire, a series of large-scale vehicle burning tests involving standing and running trains have been carried out since 1972. The Karikachi Test was planned as the first step of a test involving trains running in the open. The results include the behavior of a fire started in a vehicle; the effects of fire-resistant structures; and the effects of heat, smoke and gases on adjoining vehicles and the people on them.

Takita, T *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 3, Sept. 1976, pp 119-125, 10 Fig., 1 Tab.

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

DOTL JC

12 156250

**DEVELOPMENTS IN THE RATE OF ACCIDENTS AT WORK ON  
THE OBB [Die Entwicklung der Arbeitsunfallrate bei den OBB]**

Between 1956 and 1975, the rate of accidents to staff fell from 77.6 to 42.1. The author describes the steps taken during this period over safety at work by the OBB. [German]

Resch, K *OBB Journal* No. 6, 1976, pp 5-9, 1 Fig., 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Austrian Federal Railways, Elisabethstrasse 9, Vienna 1, Austria

12 156252

**STARTING FROM A STUDY ON FATAL TRAFFIC ACCIDENTS  
WHICH OCCURRED IN WORKING HOURS. A FEW**

**CONSIDERATIONS ON TRANSPORT SAFETY [A partir d'une  
etude sur les accidents mortels de la circulation survenus pendant les  
heures de travail. Reflexions sur la securite dans les transports]**

The author analyses statistics compiled over the past five years on accidents on journeys made by staff in France and concludes that these represent alone about 35% of fatal accidents. He mentions the example of railway accidents caused by road vehicles.

*Chemins de Fer* No. 321, Nov. 1976, pp 286-295, 7 Tab., 18 Phot.

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

DOTL JC

12 156255

**AN ASSESSMENT OF THE RISK OF TRANSPORTING  
PLUTONIUM DIOXIDE AND LIQUID PLUTONIUM NITRATE  
BY TRAIN**

This report presents the results of an assessment of the accident risk in the shipment of plutonium by rail. The risk assessment methodology is described in Section 3 of this report. The methodology is manifested in a model that relates the functional steps in the assessment. Data needs and analysis procedures are explicitly defined in the model. The model is constructed for ease of periodic updating of the data base to maintain the risk assessment current as additional data become available. The remainder of the report treats the application of the model to the assessment of the risk in train shipment of plutonium in two forms- liquid nitrate and oxide powder. The scope of the assessment encompasses the risk of plutonium releases due to transportation accidents and package misclosure and degradation.

Program Coordinator for the study was R.J. Hall

Davis, DK Heaberlin, SW Johnson, JF Peterson, PL  
Battelle Memorial Institute/Pacific Northwest Labs BNWL-1996/  
UC-71, Feb. 1977, 237 pp, Figs., Tabs., Refs., 6 App.

Contract E(45-1):1830

ACKNOWLEDGMENT: Battelle Memorial Institute/Pacific Northwest Labs  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

12 156326

**DETECTION DISTANCE IN DAYLIGHT OF ROOF-MOUNTED  
EMERGENCY VEHICLE LIGHTS**

The distance threshold for visibility in daylight was determined for four flashing incandescent signal systems and for two types of gas discharge tube arrays. The distance threshold was found to be a function of the physical construction of lamp housings and the flash pattern as well as of effective intensity. Certain combinations of internal reflections, glare, and complex flash patterns were found to reduce the overall distance threshold.

Muhler, W (South Dakota University, Vermillion); Berkhout, J *Journal of Safety Research*

ACKNOWLEDGMENT: EI (EIX770400323)  
ORDER FROM: ESL

DOTL JC

**12 156869**  
**RAILROAD ACCIDENT REPORTS--BRIEF FORMAT, ISSUE**  
**NUMBER 1--1976**

This publication contains briefs of 35 selected railroad accidents, occurring in U.S. railroad operations during calendar year 1976. The brief format presents basic facts, conditions, circumstances, and probable cause(s) in each instance. Additional statistical information is tabulated by types of accidents, and casualties related to types of accidents, carriers involved, and causal factors.

National Transportation Safety Board NTSB-RAB-76-1, Dec. 1976, 46 pp, 3 Tab.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

**12 156870**  
**RAILROAD ACCIDENT REPORT: UNION PACIFIC RAILROAD**  
**FREIGHT TRAIN DERAILMENT, HASTINGS, NEBRASKA,**  
**AUGUST 2, 1976**

About 3:40 p.m., on August 2, 1976, 39 cars of Union Pacific Railroad freight train Extra 2800 East derailed near Hastings, Nebraska. Damage was estimated to be about \$1,155,010. No one was injured. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the previously disturbed track structure to withstand the lateral forces generated by the 42nd, 43rd, and 44th cars of the train. The lateral forces resulted from a run-in of disproportionately heavy cars in the rear portion of the train.

National Transportation Safety Board NTSB-RAR-77-1, Mar. 1977, 16 pp, 1 Fig., 3 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

**12 156883**  
**THE FIRE-EXTINGUISHING AND RESCUE TRAINS OF THE**  
**SWISS FEDERAL RAILWAYS**

In 1976, Swiss Federal Railways (SBB) have placed into service ten fire-extinguishing and rescue trains. The trains are equipped for operation in tunnels, under smoke and heat, for fire fighting with water, foam and powder. The breathing equipment of the rescue car is designed to supply 60 persons with air for more than three hours. The vehicles and the equipment are briefly described. [German]

Ruegger, H *Glaser's Annalen ZEV* Vol. 10 No. 2, Feb. 1977, pp 57-51

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**12 157225**  
**RAILROAD ACCIDENT REPORT: CHICAGO AND NORTH**  
**WESTERN TRANSPORTATION COMPANY, FREIGHT TRAIN**  
**DERAILMENTS AND COLLISION, GLEN ELLYN, ILLINOIS,**  
**MAY 16, 1976**

About 4:25 a.m. on May 16, 1976, the locomotive and 27 cars of Chicago and North Western freight train No. 242 derailed as they moved eastward on a 1 deg 54' to 2 deg 15' compound curve just west of Glen Ellyn, Illinois. Another CNW freight train, No. 380, was moving eastward on an adjacent track at the time and struck the derailed cars of No. 242; the locomotive and nine cars of train No. 380 derailed. The tankhead of train No. 380's fifth car was punctured during the derailment by the coupler of an adjacent car; this released anhydrous ammonia into the atmosphere. Fourteen persons were injured as a result of the derailment and release of the ammonia. Damage from the accident was estimated to be \$1,914,600. The National Transportation Safety Board determines that the probable cause of this accident was the overturning of the outside rail of a 1 deg 54' to 2 deg 15' compound curve because the rail was unable to withstand the lateral forces of the locomotive induced by the speed of the train on track which did not comply with Federal Track Safety Standards.

National Transportation Safety Board NTSB-RAR-77-2, Mar. 1977, 24 pp, 3 Fig., 2 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

**12 157226**  
**RAILROAD ACCIDENT REPORT: DERAILMENT OF AMTRAK**  
**TRAIN ON ILLINOIS CENTRAL GULF RAILROAD, GOODMAN,**  
**MISSISSIPPI, JUNE 30, 1976**

About 8:17 a.m., on June 30, 1976, 2 locomotive units and 11 cars of Amtrak Train No. 59 derailed on the Illinois Central Gulf Railroad Company's track near Goodman, Mississippi. Thirty-four of the 145 passengers on the train were injured, 11 crewmembers were injured, 6 trackmen were injured, and 1 trackman was killed. Property damage amounted to about \$453,100. The National Transportation Safety Board determines that the probable cause of this accident was the tipping of the east rail and widening of track gage when the track structure was unable to withstand the lateral forces generated by excessive oscillations of the locomotive trucks due to irregularities in the track alignment and cross level, the wet ballast and subgrade, and the train's excessive speed. The excessive oscillations occurred even though track alignment, track surface, and crosstie spiking complied with the minimum requirements for FRA Class 4 track, indicating that these FRA requirements are inadequate. As a result of its investigation of the accident, the National Transportation Safety Board submitted three recommendations to the Federal Railroad Administration concerning its track safety standards.

National Transportation Safety Board NTSB-RAR-77-3, Apr. 1977, 21 pp, 5 Fig., 1 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

**12 157508**  
**WAYSIDE DERAILMENT INSPECTION REQUIREMENTS**  
**STUDY FOR RAILROAD VEHICLE EQUIPMENT**

An analysis of the causes of the railroad equipment-caused derailments was made. Data reported to the FRA was the primary source of derailment information; however, data from other sources were also available. Individual cause codes were consolidated into groups that had a common characteristic that might be used to detect the presence of the defect. Seven consolidated cause code groupings were identified that accounted for over 80 percent of the cost of equipment-caused derailments. Existing wayside inspection systems were evaluated. Developmental wayside inspection systems were identified. A method was developed that assigns a purchase cost number for possible wayside detection schemes that is based on the cost of derailment and effectiveness of the system. A recommendation is made that FRA set up Wayside Inspection Station(s) as a means of evaluating improvement to present systems and new wayside inspection methods.

Sponsored by the FRA/U.S. DOT through the Transportation Systems Center, Cambridge, Massachusetts.

Frarey, JL Smith, RL Krauter, AI  
Shaker Research Corporation, (DOT-TSC-FRA-77-5) Final Rpt. FRA-  
/ORD-77/18, May 1977, 150 pp, Figs., Tabs., 16 Ref.

Contract DOT/TSC-1029

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-271244/AS, DOTL NTIS, DOTL RP

**12 157513**  
**WARNING SYSTEM FOR GANGS WORKING ON THE TRACK**  
**[Anrueckmelder zur Rottenwarnung]**

The warning system consists of a control centre and lineside installations located up to 3 km away. Information is relayed by radio; warning is by visual and acoustic means. The system in question is fully consistent with safety regulations applicable to railway signalling. [German]

Korthauer, H Mueller, HG *Signal und Draht* Vol. 69 No. 1/2, pp 32-37, 1 Fig., 4 Phot.

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

12 157520

**AUTOMATION OF THE WARNING SYSTEM FOR GROUPS WORKING ON THE TRACK AT THE DB. REASONS BEHIND THIS PLAN. PRESENT STATE OF DEVELOPMENT [Automatisierung der Rottenwarnung bei der DB. Gruende. Stand. Moeglichkeiten]**

No Abstract. [German]

Wiederhold, N *Signal und Draht* Vol. 69 No. 1/2, Jan. 1977, pp 20-26, 2 Fig., 1 Tab., 3 Ref.

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

12 157531

**A MODULAR-BUILT WARNING SYSTEM TO WARN TRACK MAINTENANCE GANGS OF APPROACHING TRAINS [Ein modular aufgebauter Anrueckmelder zur Rottenwarnung]**

The author describes the train approach warning system designed by AEG-Telefunken in cooperation with the Munich Central Office, based on results obtained from data transmission radio systems on railways. The system has been designed to allow both for the technical requirements of safety and for the multiple use of a working frequency by several train approach warning systems operating independently of each other. [German]

Go, GB *Signal und Draht* Vol. 69 No. 1/2, Jan. 1977, pp 28-31, 4 Fig., 4 Phot., 6 Ref.

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

12 157576

**SAFE TRANSPORTATION SYSTEM WITH DIESEL TROLLEYS IN THE NORTH RHINE-WESTPHALIA COAL MINES [Sicherer Fahrbetrieb mit Dieselkatzen im Steinkohlenbergbau Nordrhein-Westfalens]**

Safety aspects of trolleys are discussed, and results of systematic experiments under various operating conditions are evaluated. Means of explosion and fire protection are described, and a new rail suspension is introduced. Increase in transportation volume is noted. [German]

Hoischen, G Hackenberg, W *Glueckauf* Vol. 113 No. 2, Jan. 1977, pp 59-64, 11 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

12 157700

**ANALYSIS OF NINE YEARS OF RAILROAD PERSONNEL CASUALTY DATA**

This report presents an analysis of railroad personnel casualty data for the years 1966 through 1974. The analyses examined the trends of injuries, days disabled, fatalities, and the effect of changes in man hours of employment on these trends. Accident cause categories were ranked year by year based on an index which took account of both the frequency or number of casualties in each cause category and the severity of the casualties, as measured by the median days disabled for each cause category. Also, the frequency-severity index was used to rank job classifications for each year.

Shulman, AE  
Association of American Railroads R-252, Nov. 1976, 96 pp, 25 Fig., Tabs., 3 App.

ACKNOWLEDGMENT: AAR  
ORDER FROM: AAR

DOTL RP

12 157701

**RAILROAD ACCIDENT REPORT: COLLISION OF TWO CONSOLIDATED RAILROAD CORPORATION COMMUTER TRAINS, NEW CANAAN, CONNECTICUT, JULY 13, 1976**

About 6:28 p.m., on July 13, 1976, Conrail commuter train No. 1994 collided with the rear of commuter train No. 1992 which was standing on the main track in New Canaan, Connecticut. The first car of No. 1994 and

several cars of No. 1992 derailed. Two passengers were killed and 30 persons were injured. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the engineer of train No. 1994 to perceive the train ahead and to apply the brakes at the earliest possible time. Contributing to the accident was the excessive speed of the train as it passed the controlling signal at Cane and the inadequacy of the signal system to convey to the engineer the situation ahead and to insure compliance with the indications of the signals. During the investigation of this accident, the National Transportation Safety Board issued two recommendations concerning the signal system to the Connecticut Department of Transportation and the Metropolitan Transportation Authority concerning the operation of exit doors. A recommendation on eliminating unsafe conditions in the cars' interiors was reiterated and a recommendation to the FRA to promulgate regulations on the operation and construction of commuter cars was issued.

National Transportation Safety Board NTSB-RAR-77-4, May 1977, 23 pp, 4 Fig., 3 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS, DOTL RP

12 157919

**WORK USING EXPLOSIVES IN THE VICINITY OF ELECTRIFIED RAIL LINES [Sprengarbeiten im Bereich elektrifizierter Fernbahnen]**

The article is on the dangers connected with this type of work, particularly explosions set off prematurely by stray currents. [German]

Richter, G *DET Eisenbahntechnik* Vol. 24 No. 12, Dec. 1976, pp 550-553, 5 Fig., 12 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

12 158194

**ANATOMY OF A TRAIN CRASH**

The rear-end collisions involving two trains of the Chicago Transit Authority, on a curve on the elevated Loop in downtown Chicago on Feb. 4, 1977, resulted in 11 deaths and 189 injuries. The crash caused four cars to drop to the street. The involvement of the CTA's automatic train control system, as well as the human failure, are discussed.

Young, D *Mass Transit* Vol. 4 No. 6, June 1977, pp 12-16

ORDER FROM: Carter (C Carroll), 538 National Press Building, Washington, D.C., 20004

12 272041

**CRIME IN RAPID TRANSIT SYSTEMS: AN ANALYSIS AND A RECOMMENDED SECURITY AND SURVEILLANCE SYSTEM**

This study is directed toward identifying the influence that crime has on transit ridership and toward developing measures for increasing patron and system security on a major transit network. Because of the preponderance of crime and harassment on rapid transit as opposed to surface transit, recommendations are directed toward test demonstrations on the rapid transit segment of the system. All suggested improvements are based on systematic analyses of transit crime patterns, ridership trends, a survey of public perception of transit crime, present security measures, and general operating procedures. Profiles of transit crime are derived from an 18-month series of crime data collected on the system. A crime-ridership index is employed to measure risk to patrons on various parts of the transit system. Present inadequacies in surveillance and response capability of police are described. The question of increasing manned patrols as opposed to substituting electronic or mechanical systems is examined from the viewpoint of assuring patrons of rapid protective response should an emergency arise. A publicly activated closed-circuit television system is offered as one means of addressing the security needs on highrisk portions of the rapid transit network.

Shellow, R Romualdi, JP Bartel, EW (Carnegie-Mellon University)  
*Transportation Research Record* No. 487, 1974, pp 1-12, 9 Fig., 5 Ref.

ORDER FROM: TRB

13 053199

**APPLICATION OF THYRISTORS IN RAILWAY TECHNOLOGY: CONSEQUENCES AND REMEDIES. EFFECT OF THYRISTOR CONTROLLED MOTIVE POWER UNITS ON 25 KV, 50 HZ POWER SUPPLY INSTALLATIONS OF CSD**

Measurements carried out by CSD of the current spectrum of an electric motive power unit, series SM 488.0, determination of the statistical current spectrum on the primary and secondary power supply lines of a railway sub-station with different load current values and measurement of the influence of capacitors installed at the railway sub-station on the harmonics spectrum were intended to provide a closer definition of the influence of the application of thyristor controlled motive power units on the power supply system for electric traction on CSD. It was found that the current spectrum of the motive power unit SM 488.0 generated by thyristor phase control of the bridges showed no abnormal influence of the individual harmonics. With uniquely defined electrical conditions (circular test track), attenuation of current harmonics up to 750 Hz by the power transformer at the sub-station did not exceed the 15% limit. At higher frequencies resonance phenomena were observed. An outline of the probable composition of harmonics in the current supplied by the sub-station to the section, on which the motive power vehicles were running under normal operating conditions, was obtained for the load current range. Installation of a capacitor at the sub-station causes the resonant frequency to fall. The frequency of this resonance effect does not depend on the location of the motive power unit in the supply section.

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

International Union of Railways A122/RP 21/E, Apr. 1976, 25 pp, 37 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

13 053200

**HIGH POWER TRACTION CURRENT COLLECTION AT HIGH SPEED. HEATING AND LOAD CAPACITY OF THE OVERHEAD LINES UNDER CONTINUOUS LOADING**

This report analyses heating of contact wire and catenary of an overhead line consisting of a contact wire of 100 sq mm copper and a catenary of 50 sq mm bronze, depending on the magnitude of the traction current and wind speed. Permissible traction currents as a function of time are given for some final temperature of the copper wire.

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

International Union of Railways A129/RP 6/E, Apr. 1976, 23 pp, 6 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

13 143943

**A PARAMETRIC COST STUDY OF AC-DC WAYSIDE POWER SYSTEMS**

The wayside power system provides all the power requirements of an electric vehicle operating on a fixed guideway. For a given set of specifications there are numerous wayside power supply configurations which will be satisfactory from a technical standpoint. The purpose here is to determine among a set of technically feasible designs, the one which is most cost effective. The primary cost tradeoff used in this study is between power rails and substations. Included is a presentation of the major technical and cost characteristics of each and a means of parameterizing these quantities, a procedure for optimizing costs, identification of the principal characteristics of a cost effective solution, and a comparison of ac and dc wayside power systems. For purposes of illustration, numerical values and costs for the Tracked Levitated Research Vehicle and the wayside power rail at the High Speed Train Test Center at Pueblo, Colorado, are used.

Prepared by Kusko (Alexander), Inc., Needham Heights, Mass.

Rutishauser, H Kusko, A Barrett, M  
Transportation Systems Center, Kusko (Alexander) Incorporated,  
Federal Railroad Administration Final Rpt. DOT-TSC-FRA-75-20,  
FRA/ORD-76-24, Sept. 1975, 136 pp

Contract DOT-TSC-203

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257744/3ST, DOTL NTIS

13 148612

**IMPROVEMENT OF THE DAMPING PROPERTIES OF CATENARIES [Povyshenie demfirujuschih svojstv kontaktnyh 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 Beljaev, 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 148624

**CONSIDERATIONS IN THE DESIGN OF H.V. A.C. ELECTRIFICATION FOR THE SOUTH AFRICAN RAILWAYS**

The reasons for the South African Railways' decision to adopt hv ac electrification for the Ermelo-Richard's Bay line and other suitable sections are briefly given. The solution of certain technical problems such as restricted electrical clearances and appropriate insulation levels, reduction of impedance of the catenary system, and limitation of rail to earth potentials is considered. Some of the results obtained from practical tests on an experimental ac electrification section near Vryheid are included.

Presented at the Symposium on High Voltage Engineering in South Africa, held in Johannesburg, November 18-19, 1974.

Quail, JB (South African Railways)

Council for Scientific & Industrial Res S Africa Conf Paper S-94, 1974, 10 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Council for Scientific & Industrial Res S Africa, P.O. Box 395, Pretoria, South Africa

13 148815

**THE CALCULATION OF SHORT-CIRCUIT CURRENTS IN ELECTRIC TRACTION SYSTEMS [Rascet tokov korotkogo zamykanija v elektrotjagovyh setjah]**

An explanation of a process for calculating short-circuit currents in the traction systems of line sections with several tracks. This process is based on the use of the method of superimposing calculation charts after previously arranging them symmetrically. Calculation formulae are proposed, suitable for use with different current supply circuits. [Russian]

Figurnov, EP Bocev, AS *Vestnik Vniizt* Vol. 35 No. 6, 1976, pp 8-12, 3 Fig., 3 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

13 149425

**50 YEARS OF RAILWAY ELECTRIFICATION IN THE USSR [50 let elektrifikacii zeleznych dorog SSSR]**

This article gives: a review of the main railway electrification carried out in the Soviet Union during the last 50 years, and an examination of the most important objectives assigned to specialists with a view to perfecting the equipment of direct and alternating current electric traction systems. [Russian]

Tihmenev, BN *Vestnik Vniizt* Vol. 35 No. 5, 1976, pp 1-4

ACKNOWLEDGMENT: International Union of Railways, BD

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

13 149427

**MODERNISATION OF THE INSTALLATIONS IN THE SIMPLON TUNNEL AND ON THE BRIGUE-DOMODOSSOLA LINE [La Modernisation des installations du tunnel du Simplon et de la ligne Brigue-Domodossola]**

An item of special interest in this article is the description of a type of catenary suitable for use in tunnels. [French]

Ammeter, A *Bulletin Technique de la Suisse Romande* May 1976, pp 31-35, 2 Fig., 5 Phot., 3 Ref.

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

13 149432

**CURRENT COLLECTION AT HIGH SPEEDS [Toma de corriente para alta velocidad]**

The author reviews the evolution of overhead contact lines against the background of higher speeds. He explains the performances of existing catenary systems with special emphasis on the critical running speeds permitted by these catenaries and on means of improving them. He describes in detail the resonance phenomena that may occur, and describes various methods for calculating the catenary geometry. For speeds in excess of 300 km/h, he proposes collecting systems other than the catenary: third rail, contact-free methods, magnetic induction, electro-magnetic waves, laser beam, electric arc. [Spanish]

Perez Morales, G  
Asociacion de Investigacion del Transporte No. 1, Aug. 1976, pp 53-65, 18 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Asociacion de Investigacion del Transporte, Madrid, Spain

13 149970

**STUDY INTO THE QUALITY OF CURRENT COLLECTION USING VARIOUS TYPES OF PANTOGRAPH [Issledovanie kachestva tokos'ema pri rabote elektropodvızhnogo sostava s neskol'kimi tokopriemnikami]**

The article describes a method for calculating the interaction between the overhead contact wire and several types of pantograph and gives results of the various calculations made by computer. [Russian]

Volgin, VA *Vestnik Vniizt* Vol. 35 No. 7, 1976, pp 1-4, 3 Fig., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

13 149973

**SHORT-CIRCUIT PROTECTION DEVICES IN D.C. TRACTION SUPPLY SYSTEMS [Appareils de protection contre les courts-circuits dans les reseaux de traction a courant continu]**

The protection of d.c. traction supply systems is becoming increasingly difficult, owing to the constant rise in the power of the current used. This article describes electronic devices to solve the problem of detecting line faults in various types of supply circuits.

Rohr, A *Brown Boveri Review* Vol. 63 No. 11, Nov. 1976, pp 678-681, 7 Phot.

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

13 149976

**MODERN RAILWAY ELECTRICAL EQUIPMENT OPERATED BY ELECTRIC MOTORS AND ELECTROMAGNETIC DEVICES [Appareillages ferroviaires modernes a entrainement par moteur electrique et par dispositif electromagnetique]**

A description of BMS electromagnetic contactors and a "single-leg" pantograph operated by an electric motor is given. These two devices were used for the first time on the Zurich Transport Department "Tram 2000", which is all-electric, without compressed air equipment. [French]

Aanensen, K Keller, R *Brown Boveri Review* Vol. 63 No. 12, Dec. 1976, pp 724-728, 1 Tab., 6 Phot.

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

13 151140

**NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROJECT. TASK 16: ELECTRIFICATION SYSTEMS AND STANDARDS**

The 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 40F to 90F. 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 a pantograph with improved dynamic performance.  
See also PB-257584.

Pehrson, VW Shaw, PL Suddards, AD Willetts, TA  
Electrack Incorporated, Federal Railroad Administration Final Rpt.  
FRA/NECPO-76/19, Dec. 1976, 422 pp

Contract DOT-FR-40032

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262237/1ST, DOTL NTIS

13 152399

**DETERMINING HARMONIC CURRENTS IN CATENARY SYSTEMS FOR MOTIVE POWER UNITS WITH DIRECT CURRENT CONVERTERS [Bestimmen von Oberschwingungsstromen im Fahrleitungsnetz bei Gleichstromsteller-Triebfahrzeugen]**  
No Abstract. [German]

Hofmann, G Zimmert, G *DET Eisenbahntechnik* Vol. 24 No. 9, Sept. 1976, pp 417-419, 6 Fig., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VEB Verlag Technik, Oranienburgerstrasse 13-14, 102 Berlin, East Germany

13 152403

**DEVELOPMENT OF A LIGHTING SYSTEM FOR MOUNTING THE CONTACT WIRE CATENARY SUSPENSION BY MACHINE ON WORK SITES [Entwicklung einer Baustellenbeleuchtung fuer mechanisierte Fahrleitungs-Kettenwerksmontage]**  
No Abstract. [German]

Wenk, EH Schultes, G *Elektrische Bahnen* Vol. 47 No. 10, Oct. 1976, pp 241-246, 2 Fig., 5 Phot.

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

DOTL JC

13 152419

**BASIC INSTRUCTIONS FOR BATCH EARTHING OF CATENARY SUPPORT [Osnovnye trebovaniya k gruppovym zazemlenijam opor kontaktojn seti]**

The article gives instructions for earth connections when the latter are joined to rails. It goes on to specify the permissible values for the resistances of these connections, without allowing, in the calculation, for their effect on the working of track circuits and automatic cab signalling. [Russian]

Naumov, AV *Avtomatika, Telemekhanika i Syvaz* Vol. 20 No. 6, 1976, pp 5-8, 2 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novoryazanskaya ul. Dom. 12, Moscow 288, USSR

13 152446

**EARTHING ELECTRICAL INSTALLATIONS IN PERMANENTLY FROZEN AREAS [Zazemlenija v raionah vecnoj merzloty]**  
No Abstract. [Russian]

Evseev, IG Beloglazova, NS *Avtomatika, Telemekhanika i Svyaz* Vol. 20 No. 8, 1976, pp 23-26, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novoryazanskaya ul. Dom. 12, Moscow 288, USSR

**13 152464**  
**ELECTRICAL POWER SYSTEMS OF THE WASHINGTON METRORAIL TRANSIT SYSTEM**

The electrical systems of the METRO rail system may be divided into two basic functional systems. These are the electric traction system and the support utility electrical system. The traction system converts incoming primary energy to nominal 700 volts direct current for distribution via the contact rail to provide propulsion power for the multiple-unit rail transit cars. The support utility system transforms incoming primary energy for distribution via load centers to station and right-of-way for lighting, mechanical equipment, escalators, elevators, pumps, ventilation, communications and control systems. Both of these facilities are served at primary voltages from the power utility company that serves the jurisdiction that the facility is located in. The METRO power system does not employ sub-transmission between transit facilities at primary voltages.

Presented at the 1977 Joint ASME/IEEE/AAR Railroad Conference, March 30-April 1, in Washington, D.C.

Luhrs, AG (Washington Metropolitan Area Transit Authority)  
Institute of Electrical and Electronics Engineers Tech. Pap. 77CH1237-71A, 1977, pp 49-59, Figs.

ACKNOWLEDGMENT: IEEE  
ORDER FROM: ESL

DOTL RP

**13 152610**  
**DESIGN OF TROLLEY WIRE WEAR MEASURING SYSTEM USING AN IMAGE DISSECTOR TUBE**

The measurement of trolley wire wear continuously and automatically from a car running at a maximum speed of 210 km/hr is discussed. A television system has been studied and tested since 1966 to measure the width of the worn surface of trolley wire which had a 750 mm vertical deviation and 350 mm horizontal deviation. An improved instrument, employing a newly developed three-inch diameter electromagnetic type image dissector tube, has proved to be capable of measuring the width of four trolley wires separately and simultaneously with static accuracy of 0.1 mm and dynamic accuracy of 0.2 mm. Japan National Railways have installed three instruments on measuring cars for routine use and another four instruments will be used in the near future. This paper describes the design of the system, the measuring error caused by the combination of the catenary structure of the wire and the slit aperture of the image dissector tube, the design of the image dissector tube and the signal processing. Finally, actual data measured by the system are shown as the results which represent wavy wear, irregular wear near the hanging points and correlation between wear and lateral deviation. These cannot be obtained by the conventional point-by-point method using a micrometer. [Japanese]

Horiki, K (Railway Technical Research Institute, Japan); Ichikawa, M Yasumatsu, E Tsuchiya, Y Niwa, N *Journal of the Inst of Television Engrs of Japan* Vol. 30 No. 9, Sept. 1976

ACKNOWLEDGMENT: EI (EIX770300250)  
ORDER FROM: ESL

**13 152625**  
**RELIABILITY AND MAINTENANCE OF POWER SUPPLY INSTALLATIONS FOR ELECTRIFIED RAILWAYS**  
[Zuverlässigkeit und Instandhaltung von Energieversorgungsanlagen bei elektrischen Bahnen]  
No Abstract. [German]

Schmidt, P Haese, P *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 23 No. 2, 1976, pp 493-502, 1 Fig., 4 Ref.

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

**13 152629**  
**CURRENT CALCULATIONS FOR A 2X25 JV CIRCUIT WITH AUTO- TRANSFORMERS FOR TRACTION POWER SUPPLY**  
[Rascet tokov v sisteme t'jagovovo elektrosnalozenija 2X25 kV]

The article describes the basic operating principles of the traction circuit and a method for current calculations. On the basis of this method, the author analyses the uncertainties of determining currents in the circuit using various hypotheses. [Russian]

Marskij, VE *Vestnik Vniizt* No. 8, 1976, pp 10-14, 4 Fig., 1 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Vestnik Vniizt, 3-aya Mytishchinskaya ul. 10, Moscow I-164, USSR

**13 152639**  
**STUDIES AND RULES FOR PANTOGRAPHS FOR HIGH SPEED RUNNING**  
[Badanie i wytyczne dla obdierakow pradu do duzych predkosci jazdy]

A modernised version of the AKP-4E pantograph was studied to examine the possibilities of its use for speeds of 160 Km/h. The author reviews the results of the tests done in the laboratory, on test tracks and in service. [Polish]

Jarosz, T *Prace COBiRTK* No. 63, 1976, pp 5-10, 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: *Prace COBiRTK, Warsaw, Poland*

**13 152640**  
**USE OF POLYMER MATERIALS IN ELECTRIC RAILWAY OVERHEADS**

The technology and advantages of using fibre-glass plastics with resin bonding for insulation, overhead equipment, anchoring of catenary and wires, and for sectioning contact lines are discussed.

Goroshkov, JI *Rail International* Vol. 8 No. 1, Jan. 1977, pp 7-24, 1 Fig., 20 Phot.

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

DOTL JC

**13 152646**  
**OVERHEAD LINE INSPECTION ON SAR**  
Six self-propelled diesel inspection trolleys with all-round vision inspection-dome and carrying a standard pantograph for alignment monitoring purposes on routine and pre-commissioning duties are described.

*Railway Engineer* Vol. 2 No. 1, Jan. 1977, pp 19-20, 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

**13 152780**  
**ELECTRICAL EQUIPMENT FOR LONDON UNDERGROUND EXTENSIONS**

Details are presented about trackside electric equipment for the new cross-London (England) Fleet line (completion next year) and the extension to London Airport (partially open last year). Features of the switchgear and protection equipment, low voltage switchboards, and signal frequency changers are reported.

Reeves, EA *Electrical Engineer* Vol. 53 No. 6, June 1976, pp 25-26, 4 Ref.

ACKNOWLEDGMENT: EI (EIX770200034)  
ORDER FROM: ESL

**13 152797**  
**BATTERY ENERGY STORAGE TEST (BEST) FACILITY: ITS PURPOSES AND DESCRIPTION**

The concept of a facility for testing and evaluating batteries for load leveling applications on electric utility systems has been examined and found feasible by a joint utility Industry/Government study team. Following the team's recommendation, the Electric Power Research Institute (EPRI) and the U.

S. Energy Research and Development Administration (ERDA) are currently working with the host utility selected as the prime contractor for engineering design, construction and operation. This paper describes the facility proposed, and its design criteria, to accommodate such detailed testing. It also describes the purposes and objectives of the facility, and discuss briefly the battery systems expected for testing in the facility. Discussion of the BEST Facility program both past and current activities and its scheduled and cost estimates is included.

Text of "A" Paper, presented at the IEEE Power Engineering Society Summer Meeting, Portland, Oregon, July 18-23 1976.

Beck, JW (Electric Power Res Inst, Palo Alto, California); Smith, JC Institute of Electrical and Electronics Engineers, (76CH1135-3-PWR) Proceeding A-76-488-7, 1976, 7 pp

ACKNOWLEDGMENT: EI (EIX770200063)  
ORDER FROM: ESL

**13 153067  
SELECTED BIBLIOGRAPHY OF WORLD LITERATURE ON  
ELECTRIC TRACTION FOR RAILROADS. (1970-1975 PERIOD)**

The purpose of this task was to review selected world literature on electric traction and railroad electrification of 1970-1975 period and prepare abstracts of the most important articles describing the status of foreign technology in selected areas of interest. This document lists all these abstracts. In addition, nine (9) volumes of photocopied original articles are filed with Mr. M. Guarino, Program Manager, Electrical Traction, FRA, RRD-21, Washington, D.C. 20590 for reference.

Compilation of this bibliography was sponsored by the FRA, Office of Research, Development and Demonstration, U.S. DOT.

Macie, TW  
Jet Propulsion Laboratory Bibliog. FRA-OR&D 76-296, Nov. 1976, 85 pp

Contract DOT-AR-30006 Amend 4

ACKNOWLEDGMENT: FRA, NTIS  
ORDER FROM: NTIS  
PB-265469/7ST, DOTL NTIS, DOTL RP

**13 153068  
ELECTRIFICATION FOR ENVIRONMENTALISTS: 1**  
The article discusses voltage levels, frequency, a.c. versus d.c., pantograph collection versus conductor-rail system substation sizes and spacings.

For Part 2 of this article, see RRIS 13 127850 7601.

Ogilvie, JR *Modern Railways* Aug. 1975, pp 320-323

ACKNOWLEDGMENT: FRA  
ORDER FROM: Allan (Ian) Limited, Terminal House, Shepperton TW17 8AS, Middlesex, England

DOTL JC

**13 153069  
IS ELECTRIFICATION OF RAILWAYS AN ECONOMICAL  
MUST?**

With a scientific approach, the author discusses the alternatives for generation of electrical power. Establishes criteria for selection and the economic justification for railway electrification. [German]

Ural, A *Elektrische Bahnen* Mar. 1973, pp 65-68, 16 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: ESL

DOTL JC

**13 153072  
INSTALLATION OF DRAIN TRANSFORMERS WHILE  
ELECTRIFYING GOODS TRAFFIC BYPASS IN HAMBURG**

The earth return currents can be controlled by means of drain transformers, according to the Swedish experience. The author describes the results achieved within the freight train bypass in Hamburg. The EMI has been greatly suppressed but at the same time the line impedance went up from 0.22 ohms/km to 0.38 ohms/km so that the power substations had to be closer or larger conductor sizes used. [German]

Lisson, P *Elektrische Bahnen* Feb. 1975, pp 28-32

ACKNOWLEDGMENT: FRA  
ORDER FROM: ESL

DOTL JC

**13 153079  
SNCF TEST COLLECTION SYSTEMS FOR HIGH SPEED**  
The Faiveley two-stage pantograph has been thoroughly evaluated by SNCF. It is scheduled to be used on all future high speed M.U. trainsets between Paris and Lyon.

Boissonade, P Dupont, R *International Railway Journal* Oct. 1975, 5 pp

ACKNOWLEDGMENT: FRA  
ORDER FROM: University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48103

DOTL JC

**13 154009  
TECHNICAL FEASIBILITY STUDY OF RAILROAD  
ELECTRIFICATION WITH HIGH VOLTAGE (10-50 KV) DIRECT  
CURRENT**

High-voltage (10-50 kV), direct-current (HVDC) power distribution may prove to be an economically and technically attractive option for railroad electrification. There may be potential economic advantages in both wayside installation and operation, and in the propulsion equipment aboard the rolling stock. However, before an economic comparison with AC systems can be completed, the technical feasibility of DC systems must be determined, which was the purpose of this study. This study was directed toward the wayside equipment only. The problem of HVDC rolling stock was not considered. The preliminary analysis in this report shows no technical obstacle to the use of HVDC power distribution systems for application to the wayside portion of railroad electrification. Circuit breakers, which can be applied to these systems, are in various stages of development, and with reasonably directed research can meet the duty requirements. Likewise, rectifiers which can satisfy both current and voltage requirements are within the state of the art.

Uher, RA  
Carnegie-Mellon University, Transportation Systems Center, Federal Railroad Administration Final Rpt. FRA/ORD-77/05, Sept. 1976, 75 pp

Contract DOT-TS-11702

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265018/2ST, DOTL NTIS

**13 156227  
INSTALLATION FOR THE MEASUREMENT OF CONTACT  
FORCE BETWEEN CONTACT WIRE AND CURRENT  
COLLECTOR [Einrichtung zur Messung der Kontaktkraft zwischen  
Fahrdrabt und Stromabnehmer]**

The knowledge of the pantograph contact force is important for the examination of existing catenaries and for the development of new catenaries. A measuring device with resistance strain gage and optical signal transmission is described. First measuring results are discussed. [German]

Kluzowski, B *Elektrische Bahnen* Vol. 47 No. 5, May 1976, pp 112-114, 2 Ref.

ACKNOWLEDGMENT: EI (EIX770400135)  
ORDER FROM: ESL

DOTL JC

**13 156863  
CONTACT SYSTEM [Kontaktynaya Set]**

This manual with its extensive color illustrations and concise text explains the fundamentals of the operation and repair of the catenary systems of an electrified railway. Instructions on making field repairs and on preventive maintenance by individuals and work gangs emphasize safe methods. While developed as a textbook, this volume is also of value to those involved in electronics, electromechanics and energy supply in the groups responsible for railway catenary systems. The chapters: (1) Routine Maintenance; (2) Field Repairs; (3) Elimination and Prevention of Outages; (4) Safety Techniques. [Russian]

Borts, IuV Chekulayev, VE  
Transport Publishing House 1976, 160 pp, Figs.



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

13 156881

#### FRP THIRD RAIL PROTECTIVE COVER SYSTEM

An FRP protective cover is being used over the energized contact rail on the new Washington, D.C. METRO transit system. A unique combination of mechanical, electrical and special requirements led to the development of a system consisting of a pultruded cover supported by moulded brackets for this application. The various investigations which led to the optimum choice of materials and methods is described. The quality control procedures required to assure compliance with the specifications are reviewed.

Presented at the 31th Annual Technical Conference of the Reinforced Plastics/Composites Institute.

Connors, LP

Society of the Plastic Industry, Incorporated Conf Paper Paper 10-C, 1976, 7 pp

ACKNOWLEDGMENT: British Railways

ORDER FROM: Society of the Plastics Industry, Incorporated, 355 Lexington Avenue, New York, New York, 10017

13 156902

#### IS ELECTRIFICATION THE ANSWER?

The author discusses the fact that there are no new problems to solve in the field of railway electrification and that the technology in that field is available. Whatever may have been the situation in the past, data available today show that a typical route requiring 400,000 kwh per km per annum (probably typical of a main line in Canada), was 26% more expensive using diesels in 1970 and now would be 54% more costly with diesels than when electrified. High voltage single phase ac distribution with thyristor-controlled direct current motors is a fully developed technology and has proved extremely satisfactory. A catenary system (to distribute the power to the train) can accommodate speeds up to 150 mph. For Canadian systems, 50,000 volts might be the best voltage level, although most of Europe is using 25 kv. A national voltage standard must, of course, be established.

Cass-Beggs, D (British Columbia Hydro & Power Authority, Canada)  
*Engineering Journal (Canada)* Vol. 59 No. 6, Nov. 1976, pp 36-38

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

13 156907

#### MODERN RAILROAD CONCEPTS FOR TRANSPORTING WESTERN COAL

Electrified train operation requires 10 to 20 percent less energy, in Btu per net ton-mile, than a diesel unit train and can make use of the coal it is hauling. Since the electrified railroad receives its power from a central generating source, the locomotive is relatively silent and non-polluting compared to a diesel locomotive. The generating source itself can be located away from populated areas; and, with proper pollution controls, the major pollutants from coal combustion can be reduced to levels far below those of diesel combustion.

Weiss, WD (International Engineering Company); Dunn, RH *Mining Congress Journal* Vol. 62 No. 10, Oct. 1976, pp 39-44, 11 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

13 157522

#### THOUGHTS ON A MAINTENANCE MODEL FOR ELECTRIC RAILWAY OVERHEAD CONTACT EQUIPMENT [Gedanken zu einem Instandhaltungsmodell fuer Fahrleitungsanlagen elektrischer Bahnen]

No Abstract. [German]

Haese, P *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 23 No. 4/5, 1976, pp 901-908, 1 Fig., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

13 157559

#### ADVANCE OF ELECTRIC TRACTION IN THE EUROPEAN DEMOCRATIC REPUBLICS AND IN THE USSR [Fortschritte der elektrischen Zugfoerderung in den europaeischen Volksdemokratien und der Sowjetunion]

The author summarises the progress made in the electrification of lines in East European countries and the USSR (the maps show the situation at the end of 1975). He then refers to the electric locomotive situation in more detail for the USSR and rather concisely for the other countries. [German]

Mueller, S *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 39-52, 12 Fig., 3 Tab., 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

13 157578

#### POWER SUPPLY OF THE FRENCH AC RAILROADS [Die Energieversorgung der Franzoesischen Wechselstrombahnen]

The French railroad system operates about half of its electrified network with 25 kv 50 Hz single-phase alternating current. Because of the demand for compatibility with feeding public utility three-phase lines, the selection of this system has consequences for the connection and circuit of the substations, the circuit of the catenary installations, the operation of electric facilities, the protective system and the traction of electric motive power units. These particularities of the French traction power supply system are described and some selected technical and power economic questions are dealt with. [German]

Niekamp, K *Elektrische Bahnen* Vol. 47 No. 11, Nov. 1976, pp 255-261

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

13 157688

#### WEST COAST MAIN LINE OPERATIONAL PERFORMANCE FOLLOWING ELECTRIFICATION FROM WEAVER JUNCTION TO GLASGOW

Some problems experienced in operational performance since the electrification of the West Coast Main Line from Weaver Junction to Glasgow and how these have been overcome.

Ribbons, RT *Institution of Mechanical Engineers Proceedings Proceeding* Vol. 191 No. 10, 1977, pp 99-106

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

13 157693

#### RAILROAD ELECTRIFICATION. A SPECIAL BIBLIOGRAPHY

This bibliography contains abstracts of documents dealing with railroad electrification and electric locomotives from worldwide sources. It has been prepared from the magnetic tape files of the Railroad Research Information Service.

Prepared for the Conference on Railroad Electrification: the Issues, held in Washington, D.C., June 13-15, 1977.

Transportation Research Board Bibliog. June 1977, 108 pp

ORDER FROM: Railroad Research Information Service, 2101 Constitution Avenue, NW, Washington, D.C., 20418

13 157930

#### ALTERNATING CURRENT FEEDING SYSTEM USING COAXIAL CABLE

In this system, the 25 kV 60 Hz catenary and the rail are connected every 5 to 10 km to a co-axial cable with a 2,000 sq. mm cross-section area. The diameter of the inner conductor is 28.5 mm, and that of the outer concentric conductor 55.0 mm. The mutual induction coefficient is high in the coaxial cable, therefore voltage drops in the return circuit are reduced, so that the allowable feeding distance can be lengthened. With this system, over a distance of 30 km, with a load current of 1,000A and a power factor of 0.8, voltage drop is 1,500 V as against 3,000 V with the autotransformer feeding system, and induction disturbance to telecommunication lines is reduced.

Maekawa, N *Japanese Railway Engineering* Vol. 16 No. 3/4, 1976, pp 23-25, 6 Fig., 1 Phot.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

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

DOTL JC

13 158200

## CANADIAN RAILWAY ELECTRIFICATION STUDY: PHASE I--OVERVIEW

This report is a digest and overview of the full electrification report of 764 pages. In the report, a review of both technical and economic factors is undertaken to bring into sharper focus the time frame in which it might be expected that electrification of significant portions of Canadian railways is likely to occur. Technical solutions for the unique Canadian conditions are available; however, further analysis is required to identify the acceptable solutions and their costs. The supply of electric power to meet the demands of heavy unit trains at reasonable cost, without disrupting other supply utility customers, is identified as an important technical problem. A program of investigation, research, and development designed to permit a smooth transition to effective electrified operation is outlined. The building of a 400-mile prototype operation on an existing mainline track is recommended as part of this program. The distribution of economic and other national benefits should encourage federal participation in an electrification program of national scale. The study, considering over 11,000 track miles, suggests that if electrification is to occur it cannot begin too soon.

Sponsored by the Transportation Research and Development Center, Canada, Railway Advisory Committee.

Cornell, ER Law, CE Lake, RW McDougall, JL Schwier, C English, GW  
Canadian Institute of Guided Ground Transport, (Project 6.45.75)  
CIGGT-76-10, Sept. 1976, 102 pp, Figs., Tabs.

Contract OST5-0036

13 158201

## CANADIAN RAILWAY ELECTRIFICATION STUDY: PHASE I, VOLUMES 1 AND 2

In this report a review of both technical and economic factors is undertaken to bring into sharper focus the time frame in which it might be expected that electrification of significant portions of Canadian railways is likely to occur. Technical solutions for the unique Canadian conditions are available; however, further analysis is required to identify the acceptable solutions and their costs. The supply of electric power to meet the demands of heavy unit trains at reasonable cost, without disrupting other supply utility customers, is identified as an important technical problem. A program of investigation, research, and development designed to permit a smooth transition to effective electrified operation is outlined. The building of a 400 mile prototype operation on an existing main line track is recommended as part of this program. The distribution of economic and other national benefits should encourage federal participation in an electrification program of national scale. The study, considering over 11,000 track miles, suggests that if electrification is to occur it cannot begin too soon. An annotated bibliography is included.

Sponsored by the Transportation Research and Development Center, Canada, Railway Advisory Committee.

Cornell, ER Lake, RW English, GW Law, CE Schwier, C  
Canadian Institute of Guided Ground Transport CIGGT-76-2, Apr. 1976, 764 pp, Figs., Tabs., Refs.

Contract OST5-0036

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

15 147045

**AN OVERVIEW AND CRITICAL EVALUATION OF THE RELATIONSHIPS BETWEEN LAND USE AND ENERGY CONSERVATION. EXECUTIVE SUMMARY**

This is a first-generation study to identify and assess the interrelationships between land use patterns and energy conservation. Its objectives were to: Order the interrelationships between land and energy uses in a new conceptual framework; inventory those nascent policies and research programs which have linked land use with energy conservation; and, develop a prioritized research and action agenda for hastening energy conservation through the land use management mechanism.

See also Volumes 1 and 2, PB-258 876.(PC A03/MF A01)

Priest, WC Happy, KM

Technology and Economics, Incorporated, Federal Energy Administration  
FEA/D-76/236, Mar. 1976, 27 pp

Contract FEA-CO-04-50250-00

ACKNOWLEDGMENT: NTIS

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PB-258877/0ST, DOTL NTIS

15 147046

**AN OVERVIEW AND CRITICAL EVALUATION OF THE RELATIONSHIP BETWEEN LAND USE AND ENERGY CONSERVATION. VOLUMES I AND II**

The report identifies the relationships between land use and energy use, determines what is known about them, and isolates the general types of policies and programs that Federal, state and local governments can pursue to influence land use for energy conservation purposes.

See also PB-258 877.(PC A20/MF A01)

Priest, WC Happy, KM

Technology and Economics, Incorporated, Federal Energy Administration  
FEA/D-76/237, Mar. 1976, 467 pp

Contract FEA-CO-04-50250-00

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-258876/2ST, DOTL NTIS

15 149010

**HIGHER RAIL FARES WILL HIT LONDON JOBS-PLANNERS**

The authors develop the arguments put forward by the Standing Conference on London and South East Regional Planning against the green paper suggestion of eliminating rail subsidies in the south east on all but London inner suburban services. It is disputed that the majority of commuters can afford to pay more and suggested that they often commute long distances from areas where they have been able to obtain cheap housing. A detailed discussion is given of the importance of commuter railways to the economic activity of London and the effects that any price rises would have particularly in encouraging the trend of decentralization. /TRRL/

Smith, J (Greater London Council); Copsey, D *Surveyor - Public Authority Technology* Vol. 148 No. 4390, July 1976, pp 19-21, 2 Fig., 1 Tab.

ACKNOWLEDGMENT: TRRL (IRRD 223667)

ORDER FROM: ESL

15 150953

**FINAL REPORT, AUGUST 1, 1975-JUL 31, 1976**

The report is the third in a series of final reports. The Eastern Connecticut Council works to analyze the current economic state and evaluate progress toward sound economic growth. The recovery of the region from the national recession has been strong primarily because of the dominance of capital goods production in the industrial base. Unemployment has declined in certain areas. The Council has contributed to the stabilization and stimulation of the area economy by assisting projects in investing in new industrial facilities. Jobs related to rail service have been saved largely through efforts of the Council to maintain and improve rail freight service. The Council objective is to assist industrial expansion and new industrial locations so that young people entering the labor force will have job opportunities.

Eastern Connecticut Development Council, Inc, Economic Development Administration Final Rpt. EDA-76-058, Sept. 1976, 66 pp

Grant EDA-01-6-00974-2

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-259988/4ST, DOTL NTIS

15 151164

**BART IMPACT PROGRAM REPORT CATALOG**

The report catalog contains the BART Impact Program management documents which are available through the National Technical Information Service. The report is divided into six sections: Section I and II: The Pre-BART data collection, Section III: Working Papers, Section IV: Planning Documents, Section V: Technical Memoranda and Section VI: Final Reports.

Prepared in cooperation with Department of Housing and Urban Development, Washington, D.C.

Timoney, A

Metropolitan Transportation Commission, Department of Transportation, Department of Housing and Urban Development Plan Rpt. DOT-BIP-PD-24-1-76, July 1976, 83 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-262676/0ST, DOTL NTIS

15 154040

**THE SPECIAL STUDY OF ETHNIC MINORITIES IN THE BART IMPACT PROGRAM**

The paper is an examination of one aspect of the BART Impact Program, its evaluation of impacts of the system on ethnic minorities. It is primarily a discussion of the rationale for the inclusion of specific ethnic minority concerns in the overall evaluation program. The BART Impact Program is a comprehensive assessment of BART's impacts on the social and economic life of the San Francisco-Oakland metropolitan area. Goals of the program are to elucidate the relationships between public transit and community development and assess costs and benefits of a rail rapid transit system. Specific objectives of the BIP are to determine what the impacts are, who is affected, why anticipated results are or are not occurring, and how this knowledge of BART may be useful to decision makers. (Color illustrations reproduced in black and white.)

Prepared for Department of Housing and Urban Development, Washington, D.C.

McGuire, C

Metropolitan Transportation Commission, Department of Housing and Urban Development, Department of Transportation, (UMTA-CA-09-0042) DOT-BIP-WP-28-10-77, Apr. 1976, 47 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265210/5ST, DOTL NTIS

15 154041

**WHO ARE THE TRANSPORTATION DISADVANTAGED**

Who are the transportation disadvantaged? The author proposes the definition--those groups whose same opportunities for development have been hindered, either by omission or commission, by deficiencies in the transportation system. He then asks the question of whether those conditions which make an individual disadvantaged within the general societal context are the same conditions which make one transportation disadvantaged. He discusses income, disability, place of residence and place of employment, automobile accessibility, race, sex, and age as factors which may contribute to transportation disadvantage. The author concludes that only a tenuous case at best can be made that the poor, minorities, handicapped, elderly, women, and youth are really "transportation disadvantaged", but that these groups have certain general disadvantages vis-a-vis society which make them of special concern, in an equity sense, in planning a transportation system.

Prepared for Department of Housing and Urban Development, Washington, D.C.

McGuire, C

Metropolitan Transportation Commission, Department of Housing and Urban Development, Department of Transportation, (UMTA-CA-09-0042) DOT-BIP-WP-27-10-77, Apr. 1976, 68 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265211/3ST, DOTL NTIS

15 155371

## IMPACTS OF BART ON BAY AREA HEALTH CARE INSTITUTIONS, BART IMPACT PROGRAM

The report describes the effects of Bay Area Rapid Transit System (BART) upon local health care institutions, as determined by surveys of patient travel to medical care facilities having varying degrees of public transit and BART service. Administrative personnel were also interviewed to discover and report upon institutional policy-making responses to the presence of BART.

Prepared by Jefferson Associates, Inc., San Francisco, Calif.

Minkus, D Gelb, PM

Metropolitan Transportation Commission, Jefferson Associates, Incorporated, Department of Transportation, Department of Housing and Urban Development Tech. Memo DOT-BIP-TM-22-6-77, Mar. 1977, 55 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-266614/7ST, DOTL NTIS

15 157503

## GUIDE FOR EVALUATING THE COMMUNITY IMPACT OF RAIL SERVICE DISCONTINUANCE

This guide has been prepared to provide a method for evaluation of the economic, social and environmental impacts of rail abandonments on a community. It is designed to prepare responses to any proposed action which contemplates a reduction or elimination of rail service to a community. It is oriented at a technical and quantitative assessment of the impact of branch line abandonments. The document was designed to respond to proposals under the Regional Rail Reorganization Act of 1973 for abandonments in conjunction with establishment of Conrail.

Interstate Commerce Commission Jan. 1975, 87 pp, 1 Fig., Tabs., 1 App.

ACKNOWLEDGMENT: Interstate Commerce Commission  
ORDER FROM: Interstate Commerce Commission, Office of Public Counsel, Rail Services Planning Office, Washington, D.C., 20423

DOTL RP

15 157671

## IS THERE A CASE FOR RAIL TRANSIT?

The pervasive effects of the automobile are usually underestimated and the costs of transit, easily identified, are a ready target for critics. The Bay Area Rapid Transit is used as the point of departure for a general discussion of the investments required in transportation and the role of regional and land-use planning in determining the shape of future urban regions.

*Transportation Research News* No. 7, May 1977, pp 2-5, 3 Phot.

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15 158286

## ENVIRONMENTAL ASSESSMENT UTILITY ROUTE LOCATION

A method of pretesting public and agency attitudes towards projects requiring land corridors and incorporating these attitudes into the decision-making process for corridor location is proposed. The application of a matrix Land Corridor Location Model is presented in an attempt to combine the considerations of environment, economics, and facility interaction into one reproducible decision-making process. While the Model is not applied to a specific project, its method of application and development is presented. The Model is flexible enough to be applicable to various types of land corridors and to include public and agency values in the decision-making process at virtually any point.

Wester, TE Weeter, DW *ASCE Journal of Transportation Engineering* Vol. 103 No. 3, May 1977, pp 399-407, 13 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

16 090855

**TRANSPORTATION ENERGY CONSERVATION: A PROGRAM PLAN OF POLICY-ORIENTED RESEARCH**

The Office of Transportation Research (OTR) of the Federal Energy Administration (FEA) is responsible for developing, coordinating, and managing a research program to explore transportation energy use and alternative government policies related to transportation energy conservation. This report reviews transportation's role in energy conservation, describes the role of OTR, and presents OTR's proposed research program, totalling 31 projects in six research areas for three fiscal years. Project descriptions include estimated cost, suggested scheduling, priority designation, interrelationships with other projects and programs, and detailed task descriptions.

Fraize, WE Lenard, M Lieb, J  
Mitre Corporation, Federal Energy Administration Final Rpt.  
MTR-6843, Jan. 1975, 77 pp

Contract FEA-C-04-50065-00

ACKNOWLEDGMENT: NTIS  
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PB-240734/4ST, DOTL NTIS

16 094311

**ENERGY ALTERNATIVES: A COMPARATIVE ANALYSIS**

This report develops a methodology for systematically identifying, assessing, and comparing energy alternatives in environmental impact statements (EIS). The report provides descriptions and data on the major energy resource systems in the United States and suggests procedures for using these descriptions and data. The study consists of two major parts. Part I contains descriptions of the coal, oil shale, crude oil, natural gas, tar sands, nuclear fission, nuclear fusion, geothermal energy, hydroelectric power, organic wastes, and solar energy resource systems plus descriptions of electric power generation and energy consumption. Each resource system description contains data and information on energy efficiencies, environmental residuals and economic costs. Part II describes procedures for using the descriptions and data contained in Part I in systematically evaluating and comparing the residuals, efficiencies, and economic costs of a proposed energy action and its alternatives, and suggests procedures for impact analysis.

Oklahoma University, Federal Energy Administration, National Science Foundation, Energy Research and Development Administration, Council on Environmental Quality, Environmental Protection Agency, Federal Power Commission FEA/D-75/661, May 1975, 706 pp

Contract EQ4AC034

ACKNOWLEDGMENT: NTIS  
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PB-246365/1ST, DOTL NTIS

16 130416

**ENERGY OPTIMIZATION FOR RAIL PUBLIC TRANSIT SYSTEMS**

Energy optimization for rail public transit systems is discussed from the viewpoint of an integrated systems approach. This approach considers the interaction of all the major subsystems of a total rapid transit system rather than each subsystem independently as has often been done previously. Some of the major subsystems examined include vehicles and their major propulsion, braking and auxiliary systems, train operations, environmental control facilities, and civil and structural facilities. The major factors that may significantly affect an overall energy evaluation are identified, and the ways in which each of these factors may be controlled to effect overall maximum efficiency of energy use are discussed. Energy evaluation techniques include a new strain performance simulation computer program developed by Parsons, Brinckerhoff, Quade and Douglas, Inc., as part of a 4-year subway environment research project. This paper notes that the procedures for evaluation on a total systemwide basis are applicable for any rail transit system and can be used to extend or modify existing rail transit systems and the design of new systems.

Danziger, NH (Parsons, Brinckerhoff, Quade and Douglas, Inc) *Transportation Research Record* No. 552, 1975, pp 31-39, 1 Tab., 3 Ref.

122

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16 130417

**TOTAL ENERGY REQUIREMENTS OF THE BAY AREA RAPID TRANSIT SYSTEM**

The paper concerns the energy requirements of the Bay Area Rapid Transit system in five areas: traction energy, station energy, maintenance energy, construction energy, and impact energy. Vehicle traction energy is bounded by a probable lower bound of 3.2 kW-h/car-mile (7.2 MJ/km) and a probable upper bound of 5.5 kW-h/car-mile (12.4 MJ/km). When the station and maintenance energies are added, it is expected that the eventual total operating energy cost will lie between 6 and 7 kW-h/car-mile (13.5 and 15.7 MJ/km). The construction energy is calculated through the use of energy input-output analyses and is approximately equal to the total operation energy over a 50-year projected system life. The impact energy of Bay Area Rapid Transit, that is, the energy associated with other systems built because of the existence of Bay Area Rapid Transit, is discussed. There are not as yet sufficient data available to make an estimate of this energy. The important problem of energy dependence on loading is studied, and it is found that there is a nearly inverse (hyperbolic) relation between energy intensity (kW-h/passenger-mile (joule/kilometer)) and the vehicle loading factor.

Healy, TJ Dick, DT (Santa Clara University) *Transportation Research Record* No. 552, 1975, pp 40-56, 2 Fig., 7 Tab., 5 Ref.

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16 141579

**ENERGY CONSUMPTION, POLLUTANT PRODUCTION, AND DOLLAR COST OF DIESEL SUBURBAN COMMUTER TRAINS**

The results presented in this report are based on data obtained from Chicago's three largest diesel commuter railroads. Those aspects of their operations that relate to energy and pollution are described. Service characteristics, such as average occupancy and average trip distance, are presented. Energy consumption results are presented and discussed. With energy efficiency measured in passenger-miles per Btu, it is found that trips by diesel commuter train are 3.5 times more energy efficient than Chicago Central Area auto trips. The total trip from home to suburban station, then by train to a downtown terminal, is found to be 2.2 times more energy efficient than Chicago Central Area auto trips. Pollutant production rates are presented for five pollutants. For every pollutant except sulfur oxides, trains are found to be less polluting per passenger-mile than autos. Per passenger-mile pollutant emissions from trains are, overall, less damaging by a factor of 5.5 than the per passenger-mile emissions from autos. Travel on these diesel commuter trains is less costly to society than auto travel (1972 suburban-based autos). This is the case whether one compares the train trip alone with an auto trip or the home-to-suburban-station-then-to-a-downtown-terminal trip with a home-to-downtown auto trip.

Walbridge, EW (Illinois University, Chicago) *Transportation (Netherlands)* Vol. 5 No. 3, Sept. 1976, pp 285-307, 2 Fig., 5 Tab., Refs.

ACKNOWLEDGMENT: Transportation (Netherlands)  
ORDER FROM: ESL

DOTL JC

16 143359

**CRITICAL POST-1985 ENERGY POLICY ISSUES**

This report identifies eight interdisciplinary issues requiring the most careful analysis because of their fundamental importance to energy policy. The report also identifies six issues which demonstrate a variety of justifications for formulating energy policy in the context of post-1985 considerations. A taxonomy of energy issues is developed and used to identify the extent to which nine policy areas receive too little or too much attention.

Meadows, DL Ford, FA Naill, RF  
Thayer School of Engineering, Federal Energy Administration DSD-35,  
FEA/B-76/332, July 1975, 73 pp

Contract FEA-P-03-75-7328-0

ACKNOWLEDGMENT: NTIS  
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16 146305

**SURVEY OF ALCOHOL FUEL TECHNOLOGY, VOLUME II**

Research was conducted on alcohol fuel technology. The goals of this study have been to collect a base of information on alcohols as fuel, to synthesize current research on the subject, and to make an effort to tabulate current and ongoing research. This volume is a bibliography covering all aspects of alcohol fuel technology.

See also Volume 1, PB-256 007.

Stokes, B Park, W  
Mitre Corporation, National Science Foundation Tech Rpt.  
M74-61-Vol-2, Nov. 1975, 68 pp

Contract NSF-C925

ACKNOWLEDGMENT: NTIS  
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PB-256008/4ST, DOTL NTIS

16 146580

**CHANGING ENERGY PERSPECTIVES**

Several new developments call for a reassessment of the U.S. energy independence strategy: (1) conservation programs have not been effectively implemented; (2) industry is not building synthetic-fuel production plants; and (3) a projected world-wide expansion of oil production may actually lead to price reductions in the 1980's followed by price increases in the 1990's. The Stanford Research Institute energy market model is used to evaluate these new developments. It indicates that acceleration of research and development on synthetic fuels and on increasing the efficiency of energy use may lead to reductions of over \$100 billion in the total annual U.S. energy bill in the year 2000 and to a reduction of \$30 billion in the total annual energy import bill. Since transportation is the most inefficient sector in terms of energy use, and more and more Americans seem to prefer suburban living, increasing the efficiency of the automobile is crucial. (ERA citation 01:025947)

Symposium on Alternate Fuel Resources, Santa Maria, California, 25 Mar 1976.

Werth, GC  
California University, Livermore CONF-760342-2, 1976, 13 pp

Contract W-7405-eng-48

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

UCRL-78/53, DOTL NTIS

16 146595

**APPLICATIONS AND PROSPECT OF ENERGY STORAGE BATTERIES**

The major incentive for the U. S. to develop commercial-scale batteries and other efficient storage systems is the potential saving of petroleum and natural gas. Storing the off-peak energy derived from coal and nuclear base generating plants and discharging it during the periods of high demand is the concept contemplated for electric utility application. Wide use of electric vehicles in big cities and urban areas for the improvement of air quality is another incentive. This paper addresses three key areas: the technical and economic requirements of batteries for applications to electric utility and to electric vehicles, the current development status of battery technology in the U. S. and the level of development efforts, and the prospects and the schedule for implementing the advanced battery technology. (ERA citation 01:025892)

IEEE Region Six Conference, Tucson, Arizona, April 7, 1976.

Yao, NP  
Argonne National Laboratories, Energy Research and Development Administration 1976, 4 pp, 1 Tab.

Contract W-31-109-eng-38

ACKNOWLEDGMENT: NTIS  
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Conf-76-416-2, DOTL NTIS

16 146597

**HIGH-PERFORMANCE BATTERIES FOR OFF-PEAK ENERGY STORAGE AND ELECTRIC-VEHICLE PROPULSION. PROGRESS REPORT, JULY--DECEMBER 1975**

This report describes the research and management efforts of Argonne National Laboratory's program on high-performance lithium/metal sulfide batteries during the period July--December 1975. The batteries are being developed for two applications: off-peak energy storage in electric utility networks and electric-vehicle propulsion. The battery designs for the two applications differ, particularly in cell configuration and electrode design, because of the differing performance requirements. The present cells are vertically oriented, prismatic cells with two negative electrodes of a solid lithium-aluminum alloy and a central positive electrode of iron sulfide (FeS sub 2 or FeS). The electrolyte is molten LiCl--KCl eutectic, which requires a cell temperature of about 400--450 exp 0 C. Effort was continued on the development of engineering-scale cells with hot-pressed electrodes assembled in the uncharged state (positive electrode of Li sub 2 S--Fe, negative electrode of Al). Studies of electrodes were directed principally toward developing positive electrodes of FeS sub 2 and FeS in carbon-bonded structures and toward improving the performance and lowering the cost of negative Li--Al electrodes. Materials studies included work on improved separators and feedthroughs, corrosion tests of materials in the cell environment, and postoperative examinations of cells. Work in the area of cell chemistry included the continuing studies of cell reactions and investigations of advanced cell systems. Battery design work was directed toward the design of a battery for an electric vehicle, development of battery components, and design and construction of battery testing facilities. Efforts were continued on contractual arrangements with industrial firms to develop and fabricate cells, electrodes, and cell components; the first contractor-produced cells were delivered to ANL. (ERA citation 01:025891)

Argonne National Laboratories, Energy Research and Development Administration Apr. 1976, 97 pp, 29 Fig., 15 Tab.

Contract W-31-109-Eng-38

ACKNOWLEDGMENT: NTIS  
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ANL-76-0, DOTL NTIS

16 146598

**BIBLIOGRAPHY FOR TRANSPORTATION ENERGY CONSERVATION**

A listing is given of 578 reports, books, articles, and conference papers on transportation and energy. Coverage is primarily on U. S. developments and research from 1970 to 1975. Following a section of citations of general works on energy, the bibliography contains two main parts: "Energy for Transportation" and "Transportation of Energy." Within each of these topics the arrangement is multimodal (at the urban, regional, national, or international level), then by mode. Selected information sources are listed in the last part. Within each section, entries are arranged alphabetically by author or, lacking an author, by title. References were drawn from the Transportation Center Library collection and other libraries in the Northwestern University system. An earlier bibliography, Transportation and Energy, compiled by the Transportation Center Library in March 1974, forms the basis for the arrangement and provides coverage from 1970 to 1973. (ERA citation 01:026008)

Argonne National Laboratories, Energy Research and Development Administration May 1976, 64 pp

Contract W-31-109-Eng-38

ACKNOWLEDGMENT: NTIS  
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ANL-76-XX-7, DOTL NTIS

16 146599

**BASILINE ENERGY CONSUMPTION FORECASTS FOR TRANSPORTATION: A REVIEW AND EVALUATION**

A baseline projection of energy consumption is needed to estimate the potential energy savings from proposed transport technology and operational improvements. The Reference Energy System projection by Brookhaven National Laboratories and that which Stanford Research Institute produced for Gulf Oil are reviewed here. Attention is focused on the growth rate assumptions of the forecasts and the allowances made for the sensitivity

of transport demand and technological efficiency to fuel price changes. The alternative trajectories of energy use are examined for automobile, bus and intercity air and rail passenger travel, and also for freight movement. Little, if any, justification can be found for many of the assumptions used to estimate transport demand and energy intensiveness. The assumptions underlying the Brookhaven National Laboratories projections are more explicit on changes in energy efficiency and energy price and shifts in transport patterns. However, the relationship of automobile travel, the largest component, to energy price is not specified clearly. The Stanford projection is based on seemingly arbitrary assumptions about changes in travel patterns and energy efficiency with no reference to the market process which must bring them about. It is concluded that the Brookhaven projection is a reasonable interim benchmark. Its structure should improve by refining and validating or revising the judgmental estimates on which it is based. This can be accomplished by identifying those judgements to which the energy consumption projections are most sensitive and modifying them, based on information presently available concerning the transport sector and/or information and relationships which can be developed by limited research. (ERA citation 01:026007)

Koppelman, FS O'Sullivan, P Collum, T  
Argonne National Laboratories, Energy Research and Development Administration May 1976, 42 pp

Contract W-31-109-Eng-38

ACKNOWLEDGMENT: NTIS  
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ANL-76-XX-6, DOTL NTIS

**16 146635**  
**METHODOLOGIES FOR COUNTYWIDE ESTIMATION OF COAL, GAS, AND ORGANIC SOLVENT CONSUMPTION**

The report develops methods to estimate fuel consumption information on a countywide basis for area sources in the National Emission Data System (NEDS) data bank. The specific elements of the NEDS file that were considered are: Consumption by residential sources of natural gas, liquid petroleum gas (LPG), anthracite coal, and bituminous coal; consumption by commercial-institutional and industrial sources of natural gas, LPG, anthracite coal and bituminous coal; consumption by off-highway sources and marine vessels of gasoline; consumption by railroads of diesel fuel; and retail sales of gasoline.

(PC A10/MF A01)

Myers, JP Benesh, F  
Abcor, Incorporated, Environmental Protection Agency EPA/  
450/3-75/086, Dec. 1975, 207 pp

Contract EPA-68-02-1410

ACKNOWLEDGMENT: NTIS  
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PB-259909/OST, DOTL NTIS

**16 146665**  
**NET ENERGY ANALYSIS: AN ENERGY BALANCE STUDY OF FOSSIL FUEL RESOURCES. SUMMARY REPORT**

This report examines industrial energy production in fossil fuels, emphasizing those of the Western United States. It accounts for the complete direct and indirect energies which must be used to produce energy from fossil fuels. These include the direct and indirect energies which drive or subsidize the production. It includes those energies sequestered in materials needed to build and operate the industrial production and transportation facilities which either directly or indirectly are necessary for energy production. The study includes all steps in bringing fossil fuels from reserves in the ground to the point of end use (exploration, extraction, conversion, and transportation).

See also PB-250 158.(PC A04/MF A01)

Colorado Energy Research Institute, Department of the Interior DOI/  
/OMPRA-76/03, Apr. 1976, 73 pp

Contract DI-14-01-0001-2156

ACKNOWLEDGMENT: NTIS  
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PB-259159/2ST, DOTL NTIS

**16 146666**  
**NET ENERGY ANALYSIS: AN ENERGY BALANCE STUDY OF FOSSIL FUEL RESOURCES**

This report examines fossil fuels from resources in the ground through production processes which deliver usable energy ready for consumption. It accounts for the complete direct and indirect energies which must be used to produce energy from fossil fuels, including the energies which drive or subsidize the production. It includes those energies used in the production of materials needed to build and operate the industrial production and transportation facilities which either directly produce energy or which indirectly provide energy or materials to the energy production processes.

See also PB-259 159.(PC A11/MF A01)

Colorado Energy Research Institute, Department of the Interior DOI/  
/OMPRA-76/02, Apr. 1976, 238 pp

Contract DI-14-01-0001-2156

ACKNOWLEDGMENT: NTIS  
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PB-259158/4ST, DOTL NTIS

**16 146704**  
**METHOD OF ASSESSING STRATEGIES FOR TRANSPORTATION ENERGY CONSERVATION**

A method of strategy assessment is proposed to guide the analyst in developing energy conservation programs in the transportation sector. Designing such programs to serve the interests of society as a whole is a complicated process. Clear-cut, rigorous, logical analyses of energy conservation strategies are required if the solutions adopted by the political structure are to be optimal. At present, however, decisions about energy conservation strategies in the transportation sector are clouded by the lack of a clear method for assessing these strategies. Basically, an expository method followed by a decision analysis is proposed. Once the strategies are described and their impacts projected within a well-defined future (the scenario), the impacts on selected decision variables-- such as economic impact or energy-use impact--are assessed. Then one moves out of the expository technique into the judgment of values and setting of priorities upon which to base recommendations.

Anderson, CJ LaBelle, SJ  
California University, Livermore, Energy Research and Development Administration Apr. 1976, 17 pp

Contract W-7405-Eng-48

ACKNOWLEDGMENT: NTIS  
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UCRL-52051, DOTL NTIS

**16 146729**  
**SOCIAL ORGANIZATION AND TRANSPORTATION ENERGY: AN ANNOTATED BIBLIOGRAPHY**

This annotated bibliography lists items organized according to the following themes: (1) fuel consumption and modal split, (2) economics, (3) public decision-making, (4) transportation planning, and (5) effectiveness of municipal services.

Watts, WW  
Argonne National Laboratories, Energy Research and Development Administration July 1974, 51p

Contract W-31-109-Eng-38

ACKNOWLEDGMENT: NTIS  
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ANL-74-XX-5, DOTL NTIS

**16 146760**  
**AN ECONOMIC ANALYSIS OF ENERGY SUPPLY AND DEMAND IN MISSOURI**

This report characterizes energy system flows and analyzes their interrelationships with the Missouri economy. A summary of 1985 projected fuel product requirements, an analysis of price sensitivities and elasticities of fuel products, and an analysis of the availability and substitutability of fuel products are presented. A summary of the principal potential problems that may occur in meeting the requirements in 1985 are discussed.

(PC A11/MF A01)



Missouri Office of Administration, Economic Development Administration EDA-76-052, Aug. 1976, 248 pp

Grant EDA-05-06-01541

ACKNOWLEDGMENT: NTIS  
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PB-258955/4ST, DOTL NTIS

16 147036

**PROCEEDINGS OF ENERGY RESOURCE CONFERENCE (4TH)  
HELD AT LEXINGTON, KY., ON JANUARY 7-8, 1976**

This report presents the most recent information available on the rapidly changing energy resource picture, fuel policies, economics, and technical advances. Topics covered include facilities siting, economic analyses, coal gas desulfurization, ERDA programs on coal conversion and utilization, transportation problems, and others.

See also proceedings no. 2, PB-224 750.(PC A07/MF A01)

Kentucky University IMMR19-PD14-76, June 1976, 136 pp

ACKNOWLEDGMENT: NTIS  
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PB-259123/8ST, DOTL NTIS

16 149946

**A NOTE ON THE ENERGY EFFICIENCY OF VARIOUS MEANS  
OF TRANSPORT**

Briefly summarizes the results of an investigation of the energy efficiency of various means of transport, based on statistics from Goeteborg, Sweden for 1970-1974. Tables give the data, energy consumption per place kilometre, energy efficiency and actual energy efficiency (in terms of imported oil) for tramways, buses and cars. The period covered is from 1970 to 1974. Figures illustrate losses in the course of energy flow from source to consumer for electricity (and hot water), diesel oil and petrol. The investigation shows that public transport is the most energy-efficient means of transport in Goeteborg. The relative proportions being 1:3:6 respectively for tramways, buses and cars. Decreases in the energy consumption of trams and buses over the period (1970 to 1974) is attributed to improved rights-of-way for trams and new faster bus services. It is also concluded that the increased use of public transport and the replacement of buses on the major routes by trams will result in substantial savings in energy. /TRRL/

Gunnarsson, SO Persson, B (Chalmers University of Technology, Sweden) *Traffic Engineering and Control* Vol. 17 No. N10, Oct. 1976, pp 418-419, 3 Fig., 3 Tab., 3 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 224058)  
ORDER FROM: ESL

DOTL JC

16 149987

**URBAN MASS TRANSIT ENERGY USE AND CONSERVATION  
POTENTIAL**

Presently bus and rail systems carry only 2.5% of the urban passenger traffic. Although mass transit carries only a tiny fraction of urban traffic, existing bus and rail systems are two to three times as energy efficient as automobiles. Transit efficiencies vary widely depending on city size, time of day, and type of route. Based on the limited data presented here, it appears that transit efficiency improves with increasing metropolitan area population. Bus system efficiency also depends strongly on both time of day and direction of flow. The energy implications of a number of recent transit improvements are discussed. Unfortunately, the energy impacts are slight-in part because transit now carries so few people relative to the total and in part because the increased ridership only slightly reduces automobile traffic. Thus the short-term energy-saving potential of improved and expanded transit service is small relative to the savings possible through measures that directly affect the automobile and its use.

Hirst, E (Oak Ridge National Laboratory); Stuntz, MS, Jr *Energy Systems and Policy* Vol. 1 No. 4, 1976, pp 391-406, 17 Ref.

ACKNOWLEDGMENT: EI  
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16 150516

**PRESENT AND NEAR-FUTURE DEMAND FOR ENERGY IN  
THE UNITED STATES**

The hazards of forecasting and the limitations for analysis are discussed. Historical trends in energy consumption, the correlation between energy consumption and economic welfare, and a driving force for change based on convenience, technological versatility, and economics are discussed in a section prior to energy demand projections. At BNL, 25 to 30 consuming scenarios have been projected in the following sectors: residential, commercial, industry, electric generation, and transportation. An example is followed involving residential space heating for 3 fuel types. The final section of the paper examines the impact of price increases and conservation. It is concluded that if adequate supplies of energy are not available at tolerable prices, consumption levels will adjust to balance demand against supply. It is critical to the economic future that this balancing process be achieved in an organized and rational manner, rather than blundering into a situation where the forces of fuel economics solves the problem. The author is not confident that Congress and the Federal Agencies can be counted on to provide the organized and rational balancing of the energy budget. (ERA citation 02:000876)

Environmental Nuclear Impact, Itasca, Illinois, 8 Apr 1976.

Sailor, VL

Brookhaven National Laboratory, Energy Research and Development Administration CONF-760479-1, Apr. 1976, 23 pp

Contract E(30-1)-16

ACKNOWLEDGMENT: NTIS  
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BNL-21236, DOTL NTIS

16 150517

**TRANSPORTATION ENERGY CONSERVATION: TOOLS TO  
MEET THE NATIONAL OBJECTIVE. SUMMARY OF MEETING  
HELD AT ARGONNE NATIONAL LABORATORY, ILLINOIS,  
FEBRUARY 12, 1976**

From the discussions it was concluded that: (1) energy conservation can be achieved in transportation systems through the implementation of system operation and technological strategies; (2) the Federal government should play a vital role in achieving energy conservation by strengthening its position as a central information source, a clearinghouse for state and local governments, industry, and private citizens; (3) the potential for energy savings in transportation system operation and management, demand shifts, and reductions must not be overlooked; (4) modeling can be a useful tool in both research program management and forecasting the effects of implementing a particular strategy for energy conservation; (5) the evaluation and selection process for technology R and D must include commercialization studies along with the technological indicators of program success; and (6) Federal agencies need to coordinate their own activities in this area-i.e., the Department of Transportation, the ERDA, the Federal Energy Administration, and the Environmental Protection Agency, among others, must work together so that research programs will be efficient and not redundant and strategies will not work at cross purposes. (ERA citation 02:000854)

Meeting on Transportation Energy Conservation, Argonne, Illinois, 2 Feb 1976.

LaBelle, SJ

Argonne National Laboratories, Energy Research and Development Administration CONF-760226, Mar. 1976, 43 pp

Contract W-31-109-Eng-38

ACKNOWLEDGMENT: NTIS  
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ANL-76-XX-4, DOTL NTIS

16 152397

**RAILWAY DESIGN FOR ENERGY CONSERVATION: RAILWAY  
ENGINEERS FORUM DISCUSSION**

Texts of 4 papers. The design of railway equipment to achieve conservation of resources, by G. Mitchell; The effects of various design options upon the energy consumption of railway passenger vehicles, by R.W. Stokes; The benefits of modern track design and construction, by R. Cannon; The role of the signal engineer, by J.F.P. Gilbert.

Institution of Mechanical Engineers Nov. 1976, 3 pp, Tabs., Photos.  
 ACKNOWLEDGMENT: International Union of Railways, BD  
 ORDER FROM: ESL

DOTL JC

**16 152656**  
**INCREASING THE SERVICE LIFE OF MEDIUM-SPEED MARINE AND LOCOMOTIVE DIESELS**

Results of an experimental investigation are presented in which newly developed lubricating oils, M14VTs and M15GB, were evaluated in relation to their effect on service life of diesel engines. It is demonstrated that through the rational use of these oils and through certain engineering-design changes, it has become possible to provide the necessary engine life for marine and locomotive medium-speed diesels at the level of 1970-1975 requirements. In order to ensure the operability of newly developed diesels and in order to increase the life of current- production diesels, new oils with more effective additives will be required. The determination of viscosity in accordance with GOST 33-66 on oils that have been in service for extended periods is essentially impossible, owing to the opacity and the so-called structural viscosity of these oils. Reliable viscosity values can be obtained on such oils in the Rheo/Hoeppler and Rheotest viscometers.

Vol'skii, EP (Kolomenka Locomotive Plant, USSR); Ryazanov, LS Vorozhikhina, VI Moiseev, VD *Chemistry and Technology of Fuels and Oils* Vol. 12 No. 3/4, Mar. 1976, pp 204-209, 7 Ref.

ACKNOWLEDGMENT: EI  
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**16 152782**  
**PRIORITIES OF ENERGY RESEARCH AND DEVELOPMENT**

An analysis of national research and development priorities indicates that transportation is the most critical need. Four major points are covered: (1) transportation is essential and the automobile is the major mode of choice; (2) transportation is almost totally dependent upon oil, although domestic supplies are inadequate and foreign supplies are not assured; (3) unlike other markets, such as industrial, residential and commercial, competitive alternatives for the transportation market do not exist and must be developed; and (4) there are promising Research & Development possibilities for alternate fuels and vehicles but they are inadequately funded.

Werth, GC (California University, Livermore); Ramsey, WJ Rubin, B Copper, RL Green, EA Anderson, CJ *Energy: An International Journal* Vol. 1 No. 1, May 1976, pp 11-23, 23 Ref.

ACKNOWLEDGMENT: EI (EIX770200036)  
 ORDER FROM: ESL

**16 153372**  
**MEASURES ADOPTED BY RAILWAYS TO COPE WITH THE ENERGY CRISIS**

Contents: A) General transportation planning; B) The impact of the energy crisis on transport; C) Reactivation of steam locomotives; D) Experience of some of the ESCAP Railway Administrations in surmounting the energy crisis; E) Suggestions for a governmental programme in Argentina to solve the energy crisis; and F) Conclusions.

Prepared by the U.N.'s Economic and Social Commission for Asia and the Pacific (ESCAP) Secretariat, Bangkok, Thailand.

*Transport & Communications Bull for Asia & Pacific* No. 50, Sept. 1976, pp 20-28, 3 Tab.

ACKNOWLEDGMENT: United Nations  
 ORDER FROM: United Nations Publications, Sales Section, United Nations Plaza, New York, New York, 10017

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**16 153376**  
**THE IMPACT OF THE NEW ENERGY TECHNOLOGIES**

According to an authoritative study, U.S. energy demand in the year 2000 would reach 185 quads if historical trends were to continue. That's almost 1 1/2 times present use. Probably none of the so-called "wonder solutions"--solar energy, geothermal, burning wastes, coal gasification, etc.--will be ready for any meaningful contribution by that date. Only by intense exploitation of just about every known energy source (with special emphasis on coal), in addition to conservation of energy in every possible way can we

avoid economic stagnation and considerable change for the worse in the American lifestyle.

The article is based on a paper contributed by the ASME Power and Fuels Division.

Decker, GL (Dow Chemical Company) *ASME Journal of Mechanical Engineering* Vol. 99 No. 5, May 1977, pp 24-27, 2 Fig., 6 Ref.

ACKNOWLEDGMENT: ASME Journal of Mechanical Engineering  
 ORDER FROM: ESL

**16 153377**  
**AN ASSESSMENT OF METHODOLOGIES FOR ESTIMATING NATIONAL ENERGY EFFICIENCY**

In this paper the efficiency of energy use from a national perspective is discussed. As a preliminary to discussing the question of energy-efficiency per se, it is helpful to remind the reader of an important economic concept, namely the notion of final consumption. Although ordinary language suggests that consumption is concerned with the usage (and, ultimately, discard) of material goods and energy products this is not the way economists have used the terms, at least, since the concept was fully explicated by Irving Fisher. As Frank Knight has stated: "the basic economic magnitude (value or utility) is service, not goods. It is inherently a stream or flow in time." Thus, although economists themselves have been slow to appreciate its full significance, the fact is that final consumption is nothing more nor less than the sum total of all services derived by consumers from purchased goods or service purchased directly. Although the goods that provide services normally are tangible and are sometimes difficult to distinguish from the physical materials from which they are made, the services themselves are essentially nonmaterial in nature.

Presented at the ASME Winter Annual Meeting, December 5-10, 1976. Abstracted in the ASME Journal of Mechanical Engineering, v99 n5 (May 1977), p. 88.

Ayres, RU Narkus-Kramer, M (International Research and Technology Corporation)  
 American Society of Mechanical Engineers Conf Paper 76-WA/TS-4, 1976

ACKNOWLEDGMENT: ASME Journal of Mechanical Engineering  
 ORDER FROM: ESL

**16 153395**  
**STORED ENERGY TRANSMISSION SYSTEM**

Design proposals by Phillips Industries suggest that the combination of a flywheel and continuously variable gearbox could lead to much improved fuel economy.

*Automotive Engineer* Vol. 1 No. 7, Oct. 1976, p 36

ACKNOWLEDGMENT: British Railways  
 ORDER FROM: Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London SW1H 9JJ, England

**16 153397**  
**THE ENERGY MARKET AND ENERGY PLANNING**

The purpose of this paper is to apply economic analysis of two important international energy problems. One is the short and medium-term prospects for the Organization of Petroleum Exporting Countries. The second is the much longer run, though related matter of how the transition from presently used energy sources to those we may use in the future can be accomplished.

Robinson, C *Long Range Planning* Vol. 9 No. 6, Dec. 1976, pp 30-38

ACKNOWLEDGMENT: British Railways  
 ORDER FROM: ESL

DOTL JC

**16 154397**  
**THE POTENTIAL FOR TRANSIT AS AN ENERGY SAVING OPTION**

The study was instigated in response to the growing national concern over the rapidly expanding rate of energy use in the face of possible fuel shortages. It is primarily concerned with the potential impacts and energy efficiencies of short-term policies designed to induce auto drivers to shift to public transit. In the study, an analysis is made of the energy efficiencies of various

urban passenger transportation modes, including automobile, bus, rapid rail, commuter rail, and Dial-A-Ride transit. Policies to induce mode shifts to public transit are structured into alternative scenarios for evaluation. Possible urbanized area transportation energy savings as well as reductions in vehicle miles of travel are estimated first for individual representative cities and then expanded to a national level. Representative cost evaluations of policy actions are included as well. Finally, note is made of projected secondary or indirect impacts of policy design and implementation.

Shapiro, PS Pratt, RH  
Pratt (RH) Associates, Incorporated, Federal Energy Administration Final Rpt. FEA/D-76/224, Mar. 1976, 109 pp

Contract FEA-CO-04-50077-00

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263087/9ST, DOTL NTIS

**16 154401**  
**IMPACT OF A SUBURBAN RAPID TRANSIT LINE ON FUEL CONSUMPTION AND COST FOR THE JOURNEY-TO-WORK. ANALYSIS OF THE PHILADELPHIA-LINDENWOLD HIGH-SPEED LINE**

The Philadelphia-Lindenwold High-Speed Line, a modern park-n-ride rail rapid transit system, may be regarded as a prototype of transit systems being evaluated by several U.S. metropolitan areas. Two analyses of the line are presented which are potentially useful for evaluating the potential of similar transit systems for conserving energy. First, the electrical energy consumption, fuel consumption and fuel cost per passenger-mile and car-mile are estimated from operating data, and compared with estimates for auto and bus modes. Second, these estimates are applied to the 1970 Census journey-to-work data to estimate person-miles of travel, fuel consumption and fuel cost by mode, origin and destination for an actual commuting situation. Interpretation of the results and a brief policy assessment of the role of such systems in energy conservation conclude the report.

Boyce, DE Nguyen, K Noyelle, T Webb, K  
Pennsylvania University, Philadelphia, Federal Energy Administration Final Rpt. FEA/D-77/023, Dec. 1975, 74 pp

Contract DI-14-01-0001-1700

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263048/1ST, DOTL NTIS

**16 156864**  
**NATIONAL ENERGY POLICY: AN AGENDA FOR ANALYSIS**

Today the U.S. relies far more heavily on imported energy than it ever did before. The Nation still lacks a focal point for dealing with energy problems and a coherent set of energy policies. GAO identifies eight critical national energy issues it believes require the attention of the Congress and the public in the years ahead. For each, questions requiring analysis are summarized and GAO's ongoing and planned work discussed. GAO is convinced that a concerted national effort is needed to evolve an energy policy that will stand the severe tests facing the U.S. in the remainder of this century and hopes its report will contribute to increased understanding of the Nation's energy problems.

General Accounting Office Cong Rpt. B-178205, Jan. 1977, 56 pp, 2 App.

ACKNOWLEDGMENT: General Accounting Office  
ORDER FROM: General Accounting Office, 441 G Street, NW, Washington, D.C., 20548

**16 157512**  
**ECONOMIC BENEFITS OF ENERGY CONSERVATION**

Benefits of conservation are realized in different ways by the various end-use sectors of the economy. The residential and commercial sectors can achieve numerous benefits by operational improvements, but efficiency-improving changes to the existing stock are much more important. Industry's benefits come through major changes in future processes. For transportation, mode shifts are the most important aspect for freight, and increased automobile efficiency is most important for passenger transport.

This paper is a revision of one presented at Energy Conservation: A National Forum, Ft. Lauderdale, Florida, December 1-3, 1975.

Seidel, MR (Federal Power Commission) *Energy Systems and Policy* Vol. 2 No. 1, 1977, pp 29-30, 8 Fig., 3 Tab., 9 Ref.

ACKNOWLEDGMENT: Energy Systems and Policy  
ORDER FROM: ESL

DOTL JC

**16 157703**  
**ENERGY AND ECONOMIC IMPACTS OF PROJECTED FREIGHT TRANSPORTATION IMPROVEMENTS**

This study examines current and future energy impacts for each major freight mode, by commodity, and, in many cases, by vehicle types. It also discusses potential economic impacts of these anticipated changes. The study is limited to intercity freight movements of both private and for-hire carriers. The study includes a determination of base case energy scenarios for 1972, 1980, and 1985 to serve as a basis for evaluating operational and technological impacts by 1980 and 1985 for an industry change scenario (in which industry is likely to implement changes on its own), and the government influence scenario (where changes could be accelerated by changes in economic and regulatory policies). Much of the data and findings contained in this study represent original research, but based on a relatively incomplete national data base. The report discusses in detail operational and technological changes which will have energy and economic impacts on each of the freight modes included in the report. Greater emphasis was given to intercity freight transportation by truck and railroad, with less emphasis on inland, coastal, and great lakes movements, pipelines and air freight.

Sponsored by the Office of the Secretary, U.S. DOT, through the DOT's Transportation Systems Center.

Leilich, RH Cohen, RD Green, A Kendrick, MJ  
Peat, Marwick, Mitchell and Company, (DOT-TS-OST-76-61) Final Rpt. DOT-TSC-OST-76-61, May 1977, 448 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-260000/5ST, DOTL NTIS

**16 157705**  
**ENERGY BALANCES-SOME PROBLEMS AND RECENT DEVELOPMENTS**

This paper considers a number of conceptual and practical problems in the construction of energy balances at the national (and international) level and describes the methodology used by the Department of Energy in its published energy balances for the United Kingdom. The conventions used by the major international organisations (and by a number of other countries) are also described. Problems of "energy accounting" in the sense of tracing the flows of energy from purchases through to the direct and indirect energy content of manufactured products, are outside the scope of this paper.

Department of Energy, England Energy Paper 19, 1977, 42 pp

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Her Majesty's Stationery Office, P.O. Box 569, London SE1 9NH, England

**16 157923**  
**SPECIFIC ENERGY UTILIZATION IN TRANSPORT [Spezifischer Energieeinsatz im Verkehr]**

The article summarises the study commissioned by the German Federal Minister of Transport. This study in two volumes contains 298 pages, 150 figures and tables. The study establishes comparative charts for energy consumption in all surface transport modes, including pipelines, to provide a basis for discussion of political measures aimed at energy saving in transport. [German]

*Internationales Verkehrswesen* Vol. 28 No. 6, Nov. 1976, pp 317-319

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

**16 157924**  
**DESIGN OPTION EFFECTS ON ENERGY CONSUMPTION**

The effects of these design options are shown by tables and charts: plain or roller bearings, weight of the rolling stock, electric or diesel traction,

rheostatic or regenerative braking, and maximum use of available space for seating.

Stokes, RW *Railway Engineer* Vol. 2 No. 1, Jan. 1977, pp 10-12, 2 Fig., 4 Tab., 2 Ref.

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

DOTL JC

17 053212

**ORE COLLOQUIUM. REPORT ON THE SIXTH ORE COLLOQUIUM "TECHNICAL COMPUTER PROGRAMS" LYON, 1ST TO 3RD JUNE 1976**

No Abstract.

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

International Union of Railways AZ 40/RP 8/E, June 1976

ACKNOWLEDGMENT: UIC

ORDER FROM: UIC

DOTL RP

17 090639

**TARIFF COMPUTERIZATION, STANDARDIZATION AND SIMPLIFICATION: THE STATE OF THE ART AND ITS POLICY IMPLICATIONS FOR THE DEPARTMENT OF TRANSPORTATION**

The state of the art of tariff simplification/computerization/standardization is reviewed. Emphasis is placed on rail and motor tariffs for domestic freight. Sources of difficulty in the present tariffs and their application to freight bills are examined. Methods of coping with these difficulties are described, especially those using computerized rating systems. Recommendations are made for future DOT activities in this area. These include development of a formula rate tariff, feasibility studies of rate "utilities" and shipper-carrier networks, tariff standardization studies, and coordination of government tariff research.

Thibodeau, RE

Idaho State Traffic Safety Commission Final Rpt. DOT-TSC-OST-75-5, Mar. 1975, 68 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-241049/6ST, DOTL NTIS

17 136821

**GENERAL SYSTEMS SPECIFICATION FOR A PROTOTYPE ELECTRONIC DATA INTERCHANGE SYSTEM**

This General Systems Specification was prepared as a guide for those companies contemplating the use of inter-company electronic data interchange procedures in conducting transportation transactions. The document was prepared to support a flexible approach to planning for the implementation of such procedures.

See also PB-252936 and PB-252938. See also ongoing research, RRIS 17A 099438.

Carley, J Notto, R Bass, E Kreithen, A Guilbert, E

Transportation Data Coordinating Committee, Department of Transportation Final Rpt. Apr. 1976, 43 pp

Contract DOT-OS-50017

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-252937/8ST, DOTL NTIS

17 146459

**SOME CONDITIONS OF MACROECONOMIC STABILITY IN MULTIREGIONAL MODELS**

The investigation was a part of a comparative study of the three multi-regional input-output (MRIO) models: column coefficient, row coefficient, and gravity coefficient. The objectives of the research were two-fold: (1) to examine the causes underlying negative values in the inverse generated by the row coefficient model, as well as negative projections generated by the model; and (2) to explain why the column coefficient model did not present any of these problems. The results of this research provide: (1) construction rules for the regional trade coefficient matrix that ensure that the projections generated by MRIO models will be non-negative; (2) on the basis of these rules, a test of regional technology and regional trade data that ensures non-negative projections for well-constructed NRIO models; and (3) an explanation of the malfunction of the row coefficient model, which concentrates on the violation of the rules. Finally, the policy implications of this investigation extend the conclusions of Hawkins and Simon from the single-region economy to the multiregional economy: if the production

system is internally consistent, it will be consistent with any schedule of consumption goods, the latter representing a set of policy variables.

(PC A04/MF A01)

Bon, R

Massachusetts Institute of Technology, Department of Transportation Final Rpt. DOT/TST-76/61, Sept. 1975, 69 pp

Contract DOT-OS-30104

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-259477/8ST, DOTL NTIS

17 149996

**CONTROL AND PLANNING**

The Freight Service Measurement System (FSM) of the Chessie System permits tighter controls on operations as a result of advanced planning, now done primarily on a departmental level. Features of the system include: identification of failures for each car not moving correctly; improved scheduling; generation of reports by class of traffic overhead, off-line destination, number of cars by route, customer.

Roberts, R *Modern Railroads/Rail Transit* Vol. 32 No. 2, Feb. 1977, pp 74-75, 2 Phot.

ACKNOWLEDGMENT: CNR

ORDER FROM: Cahners Publishing Company, Incorporated, Watson Publications, 5 South Wabash Avenue, Chicago, Illinois, 60603

DOTL JC

17 150467

**INFORMATION EXCHANGE ON TRANSIT ISSUES**

This report provides an overview of major issues involved in the compilation and dissemination of experience on transit issues. The increasing deficit and added complexity of transit options open make sharing of transit information even more critical. Participants in the sharing process can include federal agencies, regional planning bodies, and general-purpose and functional program officials of state, county, and local government. Mechanisms open include direct consultation, tailored documents and seminars, needs determination exercises, special user mechanisms, training courses, and demonstrations. A list of general considerations for the design of information exchange programs is also included.

Paulhus, NG, Jr Linhares, AB

Department of Transportation Final Rpt. DOT-TST-77-13, Nov. 1976, 23 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-261909/6ST, DOTL NTIS

17 151155

**CARLOAD WAYBILL STATISTICS BASED ON A SAMPLE OF WAYBILLS FOR TERMINATIONS IN THE YEAR 1974. TERRITORIAL DISTRIBUTION TRAFFIC AND REVENUE BY COMMODITY CLASSES**

The statistics for this report have been compiled from a sample of audited revenue waybills submitted to the FRA by 77 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 1974 were derived from a total of 150,692 waybills, 39,768 EM-5 documents and 1,248 multiple car statement documents resulting in 212,919 carloads. The waybill sample includes import, export, transit, rebilled, and piggyback (TOFC-trailer-on-flat-car) traffic. Excluded are shipments weighing less than 10,000 pounds and moving on less than carload rate or any quantity rates, and traffic originating in Mexico and Canada.

See also PB-258 460.

Federal Railroad Administration Statistics DOT/FRA/RPD-76/2, Dec. 1975, 234 pp

ACKNOWLEDGMENT: NTIS, Monthly Catalog of US Government Publications, GPO (TD 3.14:974)

ORDER FROM: NTIS

PB-262603/4ST, DOTL NTIS, DOTL HE2704.A23

17 152449

**THE CENTRALIZED RAILWAY TRAFFIC MANAGEMENT SYSTEM (ASUZT) IN THE USSR'S TENTH FIVE-YEAR PLAN [ASUZT v desjatom pjatiletii]**

A discussion of the problems encountered when designing and installing this complex system, during the tenth Five-Year Plan for the Soviet economy (1976-1980). [Russian]

Kulaev, KV Petrov, AP *Zheleznodorozhnyi Transport* No. 8, 1976, pp 39-47, 1 Tab., 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmannaya 2, Moscow B-174, USSR

17 152466

**COMPUTERS IN RAILROAD CONTROL: THE PROGRESS AND THE PROMISE**

Railroad applications of computers and minicomputers are described. Uses include hump classification yards, centralized traffic control, automatic car identification, weigh-in-motion scales, flat yards and other railroad control functions. Forecasts are made about future yard and control functions and about the possibility of on-board miniprocessors.

Presented at the 1977 Joint ASME/IEEE/AAR Railroad Conference, March 30-April 1, in Washington, D.C.

Cole, NM (WABCO, Union Switch & Signal Division)  
Institute of Electrical and Electronics Engineers Tech. Pap. 77CH1237-71A, 1977, pp 15-22, 2 Fig., 3 Tab.

ACKNOWLEDGMENT: IEEE  
ORDER FROM: ESL

DOTL RP

17 152804

**FREIGHT CAR MANAGEMENT SYSTEMS: A NEW WAY OUT OF THE CAR UTILIZATION DILEMMA**

Fourth generation computers allow for a great deal of exploitation by the railroad industry. Capabilities exist for the computer to take on a role of virtually operating the railroad and executing a new philosophy of operation which addresses and emphasizes service reliability and car utilization. Management relationships and roles must change also.

Presented at the 14th IEEE Conference on Decision Control, Including the Symposium on Adaptive Processes, held in Houston, Texas, 10-12 December 1975.

Shamberger, RC  
Institute of Electrical and Electronics Engineers Conf Paper 1975, pp 559-560

ACKNOWLEDGMENT: EI (EIX770200096)  
ORDER FROM: ESL

17 153061

**COMPUTER SYSTEMS AID TRACK WORK**

At a special AREA Symposium on Systems Engineering, R.F. Tuve of Southern Railway offered pointers on the practical side of developing an information system. Involvement of line personnel in system design is essential and is often overlooked. The entire system should be considered from the point of view of both present and future requirements, and all alternative approaches should be evaluated. Examples of system design on the Southern Railway are provided; particular case involves development of a track data system.

*Progressive Railroading* Vol. 20 No. 1, Jan. 1977, pp 59-62, 1 Fig., 1 Phot.

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

DOTL JC

17 153368

**AN INFORMATION SYSTEM DESIGN FRAMEWORK FOR STATE RAIL PLANNING**

This paper describes an information system developed to support the state rail planning process, with special emphasis on the factors related to

disposition of abandoned rail rights-of-way. The information system developed for rail re-use planning is claimed to be expandable to rail distribution analysis and rail management. The concept is compatible with information systems for other modes and is relatable to land use information systems.

U.S. DOT's Office of University Research sponsored this work.

Dueker, KJ Milligan, JA  
Iowa University Tech. Rpt. No. 42, Mar. 1975, 29 pp, 5 Fig., 2 Tab., 16 Ref., 1 App.

ACKNOWLEDGMENT: DOT  
ORDER FROM: Iowa University, Institute of Urban and Regional Research, 102 Church Street, Iowa City, Iowa, 52242

DOTL RP

17 153374

**THE DESIGN OF COMPUTER BASED PLANNING AND MODELING SYSTEMS**

In this paper the authors describe a collection of elements which they believe to be of critical importance in designing a corporate planning model. Their objective is to develop a set of criteria for not only designing a planning and modeling system, but a set of criteria which can also be used to facilitate the evaluation and comparison of alternative planning and modeling systems. There are over 50 planning and modeling software packages on the market today. This paper attempts to provide the reader with a convenient checklist of possible features to consider in either designing one's own system or selecting an appropriate software package.

Naylor, TH (Duke University); Mansfield, MJ (Social Systems, Incorporated) *Long Range Planning* Vol. 10 No. 1, Feb. 1977, pp 16-25, 1 Fig.

ACKNOWLEDGMENT: Long Range Planning  
ORDER FROM: ESL

DOTL JC

17 153954

**A PROGRAM FOR IMPROVING TRANSIT INDUSTRY MANAGEMENT INFORMATION SYSTEMS. VOLUMES 1-3**

The report presents an internal management systems improvement plan for the urban mass transit industry. It is the final report of a series of three reports which develop a transit management information systems improvement program. Volume 1 consists of three sections: Section 1 provides an overview of the transit industry; Section 2 presents a proposed set of systems projects for UMTA sponsorship based on criteria herein; and Section 3 presents a methodology and process for individual transit properties to follow in their systems planning activities.

Prepared in cooperation with project FARE, Industry Control Board, Wells Research Co., Silver Spring, Md., and Harmon and Associates, Kensington, Maryland. Volume 1 (UMTA-IT-06-0094-77-5): Information Systems Improvement Plan Summary, 91 pp; Volume 2 (UMTA-IT-06-0094-77-6): Systems Development Work Programs, 192 pp; Volume 3 (UMTA-IT-06-0094-77-7): Systems Design Reference Manual, 222 pp. Also available in set of 3 reports PC E09, PB-264 523-SET.

Simon, ME  
Andersen (Arthur) and Company, Project FARE/Industry Control Board, Wells Research Company, Harmon and Associates, Urban Mass Transportation Administration, (UMTA-IT-06-0094) Final Rpt. UMTA-IT-06-0094-77-5, Sept. 1976, 505 pp

Contract DOT-UT-40025

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264523-SET/ST, DOTL NTIS

17 154031

**FEASIBILITY STUDY OF A CENTRALIZED CAR LOCATION MESSAGE SYSTEM**

The objective of the study was to determine the economic and technical feasibility of centralizing the railroad industry's Car Location Message (CLM) systems. It is intended to provide information from which a decision can be made on whether to develop a centralized CLM system using the Association of American Railroads computer and communication facilities. The scope of the study included accumulation of relevant information from

railroads and shippers, functional description of a centralized system, economic analysis of costs and benefits to railroads and shippers of centralized CLM or only centralized file updating for CLM, and development of an implementation plan.

Prepared in cooperation with Peat, Marwick, Mitchell and Co., Washington, D.C. See also ongoing research, RRS 17A 099401.

Laughlin, MO Cetinich, J Ronsberg, V King, L  
Association of American Railroads, Peat, Marwick, Mitchell and  
Company, PRC Railway Systems Final Rpt. FRA/OPPD-77/3, Feb.  
1977, 109 pp

Contract DOT-FR-65146

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265180/OST, DOTL NTIS

**17 154418**  
**INTERACTIVE COMPUTER GRAPHICS. VOLUME 2.**  
**FEBRUARY 1976-JANUARY 1977 (CITATIONS FROM THE**  
**ENGINEERING INDEX DATA BASE)**

The bibliography cites abstracts from worldwide literature on computer hardware and computer software implementation of interactive graphics systems. Included are applications in circuit design, electrocardiography, transportation systems, cartography, architectural design, structural engineering, education, and curve fitting. (This updated bibliography contains 127 abstracts, all of which are new additions to the previous edition.)

See also NTIS/PS-77/0108, and NTIS/PS-77/0109. Supersedes NTIS/PS-76/0078.

Grooms, DW  
National Technical Information Service Bibliog. Mar. 1977, 136 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0111/3ST, DOTL NTIS

**17 154419**  
**INTERACTIVE COMPUTER GRAPHICS. VOLUME 1.**  
**1973-JANUARY 1976 (CITATIONS FROM THE ENGINEERING**  
**INDEX DATA BASE)**

The bibliography cites abstracts from worldwide literature on computer hardware and computer software implementation of interactive graphics systems. Included are applications in circuit design, electrocardiography, transportation systems, cartography, architectural design, structural engineering, education, and curve fitting. (This updated bibliography contains 202 abstracts, all of which are new entries to the previous edition.)

See also NTIS/PS-77/0108, and NTIS/PS-77/0109.

Grooms, DW  
National Technical Information Service Bibliog. Mar. 1977, 209 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0110/5ST, DOTL NTIS

**17 154420**  
**INTERACTIVE COMPUTER GRAPHICS. VOLUME 2.**  
**1976-JANUARY 1977 (CITATIONS FROM THE NTIS DATA BASE)**

Federally-funded studies are cited on hardware and software implementation for interactive graphics systems. The bibliography includes applications in education, electrophysiology, architectural design, structural engineering, transportation systems, chemistry, cartography, dance choreography, aircraft displays, and curve fitting. (This updated bibliography contains 77 abstracts, all of which are new entries to the previous edition.)

See also NTIS/PS-77/0110, and NTIS/PS-77/0111.

Grooms, DW  
National Technical Information Service Bibliog. Mar. 1977, 82 pp

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-77/0109/7ST, DOTL NTIS

**17 154421**  
**INTERACTIVE COMPUTER GRAPHICS. VOLUME 1. 1970-1975**  
**(CITATIONS FROM THE NTIS DATA BASE)**

Federally-funded studies are cited on hardware and software implementation for interactive graphics systems. The bibliography includes applications in education, electrophysiology, architectural design, structural engineering, transportation systems, chemistry, cartography, dance choreography, aircraft displays, and curve fitting.

See also NTIS/PS-77/0110, and NTIS/PS-77/0111.

Grooms, DW  
National Technical Information Service Bibliog. Mar. 1977, 209 pp

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-77/0108/9ST, DOTL NTIS

**17 156206**  
**RAILROAD TRANSPORTATION PLANNING MODELS AND**  
**THEIR SUCCESS**

The paper describes some computer models and systems developed during the last two years which have assisted planning in Canadian National Railways. The main features of these models are summarized together with comments on their implementation. The first model is an information system for planning. This system includes models which translate market forecasts into workloads. The second model is an analytical or algebraic model which estimates average over-the-road time for different types of trains moving over a common track. The third model simulates trains moving across the main line and through small yards. It helps in optimally scheduling trains.

Proceedings of the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976.

Belshaw, PN (Canadian National Railways)  
International Federation of Automatic Control Proceeding 1976, pp  
89-96

ACKNOWLEDGMENT: EI (EIX770400451)  
ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pitts-  
burgh, Pennsylvania, 15222

**17 156214**  
**GLOBAL SOLUTIONS FOR A NONCONVEX, NONCONCAVE**  
**RAIL NETWORK MODEL**

This paper is concerned with developing long-range planning models of transportation systems to assist planners in assessing the impact of various levels of service in a transportation network. Railroad distribution networks are studied in particular, and emphasis is placed on the problem of determining optimal levels of service (improvements, degradations, abandonments) on each arc in the existing network. The problem is to optimally design a transportation system; the term "design", as used here, does not comprehend new networks, but more importantly, the optimization or "pruning" of existing transshipment networks. The model is formulated so that improvements to the shipping arcs are included as decision variables: The concave transshipment problem is extended to the case where coefficients of the shipping cost functions are treated as decision variables.

LeBlanc, LJ (Southern Methodist University) *Management Science* Vol.  
23 No. 2, Oct. 1976, pp 131-139, 4 Ref.

ACKNOWLEDGMENT: EI (EIX770400348)  
ORDER FROM: ESL

DOTL JC

**17 156219**  
**ENGINE SCHEDULING PROBLEM IN A RAILWAY NETWORK**

The mathematical version of a scheduling problem faced by a railway company that employs several engine types to provide power for its trains is presented. Each train has motive power requirements that are determined by the weight and length of the train, and the route it travels. The operating constraint is to provide a train with sufficient engines to meet its motive power requirements. The authors give a mathematical formulation of selecting the mix of engine types that gives the lowest capital investment and operating cost and explore a method of solution based on the decomposition method of Benders. The computational results obtained are satisfactory for medium size problems and unsatisfactory for large size problems.



Florian, M (Montreal University, Canada); Bushell, G Ferland, J Guerin, G Nastansky, L *INFOR Journal/CORS* Vol. 14 No. 2, June 1976, pp 121-138, 9 Ref.

ACKNOWLEDGMENT: EI (EIX770400200)  
ORDER FROM: ESL

**17 156233**  
**DEVELOPMENT OF THE LABORATORIES' CONVERSATIONAL SYSTEM FOR TIME SERIES ANALYSIS: LABOCS/TSA**

The implementation of a computer system which can process and analyze measured data conversationally using interactive graphics is described. Data from railroad road or laboratory tests, recorded on analog magnetic tapes and converted into digital time series can then be analyzed statistically with a digital computer. The implementation of the conversational processing of measured data using interactive graphics is described. Various data processing functions included in the system are explained simply and some examples are given.

Yoshimura, A Mori, T Yoshida, Y *Railway Technical Research Institute Quarterly Rpt* Vol. 17 No. 3, Sept. 1976, pp 108-112, 9 Fig., 6 Ref.

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

DOTL JC

**17 157248**  
**USE OF LARGE SCALE MATHEMATICAL PROGRAMMING MODELS IN TRANSPORTATION SYSTEMS**

A review of the literature is presented on a number of successful applications of nonlinear and integer programming models for transportation systems. The network equilibrium problem, the network design model, and the stochastic transportation problem are analyzed.

LeBlanc, LJ (Southern Methodist University) *Transportation Research* Vol. 10 No. 6, Dec. 1976, pp 419-421, 16 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**17 157510**  
**COMPUTERS HELP TO MANAGE THE WORLD'S LARGEST FREIGHT CARRIER**

The 85,000-mile (135,000 km) network of the Soviet Railways handles more than twice the tonnage handled by any other system. In the 1970s development was started on a hierarchy of linked computer-based management information systems which could be used in real time to optimize all train movements and yard operations. The first stage, introduced in 1975, created a data bank which holds the location and status of cars and locomotives. Programs are now evolving which will enable managerial decisions to be made automatically so as to optimize resource utilization.

Kharlanovitch, IV (USSR Ministry of Railways) *Railway Gazette International* Vol. 133 No. 6, June 1977, pp 222-225, Figs., Photos.

ORDER FROM: ESL

DOTL JC

**17 157540**  
**THE COMPUTER DECIDES--PROBLEMS AND EXPERIENCE WITH AN OPERATIONAL SYSTEM [C'est l'ordinateur qui decide--Problemes et experiences dans la cadre d'un systeme operationnel]**

The CFF has done extensive work in setting up a computer operating system which makes its own decisions for the distribution of empty rolling stock, working at minimum cost and meeting customers' requirements to the maximum as regards quantity (number of cars requested) and quality (type of stock requested). This article discusses problems, and effects on all those involved in the introduction of the system, also the conclusions that may be drawn after eight months' operating experience. [French]

Herren, H *Rail International* Vol. 8 No. 3, Mar. 1977, pp 135-140, 1 Tab., 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

**17 157698**  
**FREIGHT CAR UTILIZATION: DEFINITION, EVALUATION AND CONTROL. FINAL REPORT. TASK FORCE 2**

This Task Force was charged with developing a definition of utilization that would recognize not only the physical and economic aspects of freight car use, but also clarify the interaction and control of these aspects of car utilization. It recommends a coordinated set of physical and financial measures to monitor and control freight car utilization. Despite growing financial pressure to improve utilization, the group found limited evidence of effective car-utilization systems. There has been no correlation between changes in utilization and a railroad's financial condition. No single measure is adequate for all purposes; railroads need to use several measures in a well-defined manner to relate physical utilization to financial performance. Effective utilization involves more than efficient empty car distribution or movements. Although both the operating and marketing/traffic departments make decisions affecting utilization, the operating department is generally responsible for utilization. Utilization control systems must enable officers to evaluate tradeoffs among operating expenses, investment costs and car ownership costs.

Association of American Railroads Final Rpt. R-257, Mar. 1977, 23 pp, Tabs., 3 App.

ACKNOWLEDGMENT: AAR  
ORDER FROM: AAR, NTIS

DOTL RP, PB-267292/AS, DOTL NTIS

**17 157943**  
**RECENT ADVANCES IN TRANSPORTATION NETWORK MODELING**

The large scale network models, such as the national rail network model (over 15,000 arcs) have been of limited utility because they are overly simplistic and very expensive to run. However some success has been obtained with models run on medium-sized networks, to provide solutions to improvement and optimization problems.

Included in Freight Transportation: A Digest of Technical Papers, a report sponsored by the Office of the Secretary, U.S. DOT, RRIS 17 144088 7701.

Fuertes, L  
Transportation Systems Center Tech Paper DOT-TSC-OST-77-68, Oct. 1976, pp 42-50, 8 Ref.

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

**17 157944**  
**TARIFF COMPUTERIZATION IN FUTURE FREIGHT SYSTEMS**

A review of the difficulties in the application of tariff rates and accurate billing by carriers, and suggested solution to reduce the cost and increase the efficiency of paperwork by computerization.

Included in Freight Transportation: A Digest of Technical Papers, a report sponsored by the Office of the Secretary, U.S. DOT, RRIS 17 144088 7701.

Thibodeau, RE  
Transportation Systems Center Tech Paper DOT-TSC-OST-77-68, Oct. 1976, pp 52-67, 2 Fig., 1 Phot., 52 Ref.

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

**17 157953**  
**NOW--THE "TUBE" FOR CREW CALLING**

The St. Louis San Francisco has replaced the call board with a microprocessor-based video dispatching system at its Springfield, Mo., terminal. Twelve CRT displays reflect the job assignment situation for all the operating positions at this pivotal Frisco terminal.

*Progressive Railroading* Vol. 20 No. 5, May 1977, pp 38-39, Photos.

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

DOTL JC

17 157954

**NOW--THE "TUBE" FOR LOCOMOTIVE MAINTENANCE**

The mechanical and management information systems groups of the Seaboard Coast Line Railroad have developed an information system for the management of servicing and maintaining 1,300 diesel locomotives. Six major diesel shops work with the same record base which can be retrieved and displayed. The four-phase program has involved (1) Records on running maintenance; (2) Records of locomotive components; (3) Computer processing of locomotive mileages with anticipated parts replacements correlated with service; and (4) Compilation of wheel life, lubricating oil life and maintenance costs.

*Progressive Railroading* Vol. 20 No. 5, May 1977, pp 46-48, 1 Fig., Photos.

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

DOTL JC

17 158206

**A USER ANALYST GUIDE TO THE EXTENDED RAILCAR NETWORK MODEL**

A user analyst guide to the Railcar Network Model is presented. This system of computer programs is a comprehensive tool for railway analysis and planning, capable of representing individual lines and yards, or of combining these to form a model of an entire railway system. The theory behind the models, and descriptions of earlier program versions, are published in The Railcar Network Models (CIGGT Report 75-11, June 1975). These programs have been updated, and new programs have been added for editing input data and for expressing results in extended railways report format. The report describes the architecture of the current version of all programs, and specifies control cards, data input requirements and format specifications under the options available. Brief descriptions of the necessary theory have been included to assist the analyst. In addition, a detailed hypothetical example demonstrates the necessary analysis and data collection required to

model a railway system, together with the steps necessary to prepare and code the input data to operate this model.

Sponsored by the Department of Transportation, Canada, Railway Transportation Directorate, Surface Transportation Administration.

Schwier, C Ganton, TD Macdonald, JA  
Canadian Institute of Guided Ground Transport CIGGT-76-3, May 1976, 262 pp, Figs., Tabs., 3 App.

Contract 100315

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

17 159474

**PROGRESS IN COMPUTER AIDED RAIL TIME TABLE COMPILATION**

The report reviews the railway timetable compilation process and describes areas where computerisation can assist timetable development. It describes a program developed to compile a railway timetable and suggests ways in which further development should proceed. /TRRL/

Weston, G Wren, M Dexter, K Packer, J  
London Transport Executive Monog Rpt. Op. Res. Memo M318, 1976, 16 pp, 8 Fig.

ACKNOWLEDGMENT: TRRL (IRRD-225552)

ORDER FROM: London Transport Executive, Planning Research Division, Transad House, Leicester Square, London WC2, England

7704069

18 147385

**THEORETICAL FRAMEWORK FOR THE EVALUATION OF ECONOMIC AND FINANCIAL IMPACTS OF BART**

The Working Paper outlines the theoretical framework for evaluating the economic and fiscal impacts of the construction and operation of the Bay Area Rapid Transit system. Impacts described in the Working Paper include direct construction expenditures, operating expenditures, impacts on the economy because of changes in transportation services, fiscal burden and impacts on the use of bonded debt in the San Francisco Bay Region.

Sponsored in part by Department of Housing and Urban Development, Washington, D.C. Prepared by McDonald and Grefe, Inc., San Francisco, Calif.

Grefe, R McDonald, AN McLeod, D  
Metropolitan Transportation Commission, McDonald and Grefe,  
Incorporated, Department of Transportation, Department of Housing  
and Urban Development Work Paper DOT-BIP-WP-25-7-76, July 1976,  
76 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261362/8ST, DOTL NTIS

18 147392

**NORTHEAST CORRIDOR HIGH-SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROGRAM. TASK 18-SUPPORT SERVICES: ENGINEERING, ECONOMICS AND COST ESTIMATING**

The report is a summary of analyses and refinements, where applicable, of the available track alignment data on the Northeast Corridor, track realignment unit costs, minor realignment costs, lateral track shifts, vehicle costs, and train performance calculations for the purpose of further defining curve realignments and vehicle characteristics. The report deals with these topics based on both the 150 mph system, defined in previous NEC reports, and the 120 mph system.

Prepared in cooperation with Urban Pathfinders, Inc., Baltimore, Md.

Arlund, RC Ronald, CC Olsen, KA Ferber, WE McInnis, MJ  
Bechtel Corporation, Urban Pathfinders, Incorporated, Federal Railroad  
Administration Final Rpt. FRA/ONECD-76/18, July 1976, 456 pp

Contract DOT-FR-66005

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261542/5ST, DOTL NTIS

18 149387

**TRANSPORT INVESTMENT APPRAISAL IN THE PRESENCE OF UNCERTAINTY**

Techniques employed for the appraisal of alternative transportation investment projects in the presence of uncertainty have been frequently and justifiably criticised. In this paper, the nature of such criticisms is analysed and from this analysis is developed a new method for handling uncertainty in investment appraisal. This takes full advantage of the insight the decision maker may reasonably be expected to have about the future without requiring heroic assumptions. The method is simple to put into practice and is based on an a priori ranking of the likelihood of future states of nature. Its application is appropriate in situations where results may reasonably be averaged over a series of investments and it can be shown to be more reliable in such circumstances than conventional techniques of the decision theoretic literature, such as maximum, maximax, etc. A simple numerical illustration is given.

Pearman, AD *Transportation Research* Vol. 10 No. 5, Oct. 1976, pp  
331-338

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

18 149418

**COMPARISON AND GENERAL ANALYSIS OF THE PRODUCTIVITY AND COST OF FREIGHT TRANSPORT BY RAIL OR BY ROAD [A vasuti es kozuti aruszallitas termelekenysenek es koltsegeinek altalanos elemzése es osszehasonlitasa]**

Based on a new concept, the author attempts to work out mathematical relationships suitable for calculating the productivity of rail and road freight transport, and to make a direct comparison between the costs of the services in these two transport branches. [Hungarian]

Nagy, M *Kozlekedestudomanyi Szemle* Vol. 26 No. 5, May 1976, pp  
195-208, 6 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Kozlekedestudomanyi Egyesulet, Szabadsag ter 17.III.339,  
Budapest 5, Hungary

18 152671

**THE COMMISSION ON THE COSTS OF TRANSPORTING GRAIN BY RAIL. REPORT. VOLUME 1**

Because subsidies are paid to Canadian National and Canadian Pacific by the Canadian Government for moving so-called "statutory grain" from Prairie provinces to Pacific Coast and Lakehead ports, a Commission was appointed to determine the cost of such grain movement. This volume is dedicated to the first of three tasks assigned--development of the total costs and revenues of transporting statutory grain by rail under contemporary conditions. Cost studies were submitted by the railways and the provinces. It is concluded that revenues received by railways do not cover the costs incurred. Excluding subsidy payments received for continued operation of grain-dependent lines, the revenue shortfall is substantial, ranging between \$132 and \$157 million. Even with the subsidy, the deficit falls between \$80 and \$105 million.

Snavely, CM, Jr  
Commission on Costs of Transporting Grain by Rail Comm. Rpt. Vol.  
1, Oct. 1976, 272 pp, 11 Tab., 16 App.

ORDER FROM: Ministry of Transport, Canada, Tower C, Place de Ville,  
Ottawa, Ontario K1A 0N5, Canada

DOTL RP

18 153378

**BENEFIT ESTIMATES FOR RECREATIONAL RE-USE OF ABANDONED RAILROAD RIGHTS-OF-WAY**

The abandonment of a significant lengths of railroad right-of-way often provides land which can be re-used for a variety of activities or purposes. Recreational re-use, particularly in the form of bicycle trails, is especially attractive as one alternative re-use of railroad abandonments. Some form of cost-benefit analysis is often suggested as a means of choosing between conflicting alternative uses of a specific resource. The application of the standard cost-benefit techniques to recreation is extremely difficult due primarily to a number of measurement problems. In the case of a specific recreation activity such as bicycle trail use the measurement problems are compounded as a result of a lack of empirical information. This report reviews the problems associated with attempts to determine values for non-priced goods and services in general and recreation in particular. A procedure for estimating minimum benefit values which accrue from the recreational re-use (bicycle trails) of railroad abandonments is presented. Finally, through a test application of the procedure a number of methodological refinements are suggested and discussed.

Joyal, AN  
Iowa University Tech. Rpt. No. 40, Mar. 1975, 27 pp, 2 Fig., 2 Tab., 19  
App.

ACKNOWLEDGMENT: Inst of Urban & Regional Research, Iowa University  
ORDER FROM: Iowa University, Institute of Urban and Regional Research,  
102 Church Street, Iowa City, Iowa, 52242

DOTL RP

18 153389

**WORLD POLL: PART ONE**

More comprehensive than ever before, this year's World Poll of Railway Capital Expenditure demonstrates that the market for railway equipment remains steady in spite of the troubled economic situation in many parts of the world.

*International Railway Journal* Jan. 1977, 4 pp

ACKNOWLEDGMENT: British Railways

ORDER FROM: Simmons-Boardman Publishing Corporation, 508 Birch Street, Bristol, Connecticut, 06010

DOTL JC

18 153979

**URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS AND RECORDS AND REPORTING SYSTEM**

No abstract available.

Set includes PB-264 877 thru PB-264 880.

Andersen (Arthur) and Company, Urban Mass Transportation Administration 4 vols., Jan. 1977, 505 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264876-SET/ST

18 153980

**URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS AND RECORDS AND REPORTING SYSTEM. VOLUME I. GENERAL DESCRIPTION**

The purpose of the report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended. This report is presented in four volumes: Volume 1 presents an overview of the systems, and an identification of the analytical potential provided by comparative data generated by the systems.

Also available in set of 4 reports PC E11, PB-264 876-SET.

Andersen (Arthur) and Company, Urban Mass Transportation Administration, (UMTA-IT-06-0094) UMTA-IT-06-0094-77-1, Jan. 1977, 64 pp

Contract DOT-UT-40025

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264877/2ST, DOTL NTIS

18 153981

**URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS AND RECORDS AND REPORTING SYSTEM. VOLUME II. UNIFORM SYSTEM OF ACCOUNTS AND RECORDS**

The purpose of the report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended. Volume 2 contains the definitions for the uniform systems of accounts and records. Modes of transit service subject to this Section 15 system are also defined in this Volume.

See also Volume 1, PB-264 877. Also available in set of 4 reports PC E11, PB-264 876-SET.

Andersen (Arthur) and Company, Urban Mass Transportation Administration, (UMTA-IT-06-0094) UMTA-IT-06-0094-77-2, Jan. 1977, 268 pp

Contract DOT-UT-40025

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264878/0ST, DOTL NTIS

18 153982

**URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS AND RECORDS AND REPORTING SYSTEM. VOLUME III. REPORTING SYSTEM FORMS AND INSTRUCTIONS-REQUIRED**

The purpose of the report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended. Volume 3 contains illustrative forms for each of the reports required to be submitted under Section 15 and instructions for completing these forms.

See also Volume 2, PB-264 878. Also available in set of 4 reports PC E11, PB-264 876-SET.

Andersen (Arthur) and Company, Urban Mass Transportation Administration, (UMTA-IT-06-0094) UMTA-IT-06-0094-77-3, Jan. 1977, 60 pp

Contract DOT-UT-40025

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-264879/8ST, DOTL NTIS

18 153983

**URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS AND RECORDS AND REPORTING SYSTEM. VOLUME IV. REPORTING SYSTEM FORMS AND INSTRUCTIONS-VOLUNTARY**

The purpose of the report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended. Volume 4 contains illustrative forms and instructions for optional revenue and expense reporting.

See also Volume 3, PB-264 879. Also available in set of 4 reports PC E11, PB-264 876-SET.

Andersen (Arthur) and Company, Urban Mass Transportation Administration, (UMTA-IT-06-0094) 4 UMTA-IT-06-0094-77-, Jan. 1977, 112 pp

Contract DOT-UT-40025

ACKNOWLEDGMENT: NTIS

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PB-264880/6ST, DOTL NTIS

18 156249

**THE CHEAPEST TRANSPORT MODE? COMPARISON BETWEEN RAIL AND ROAD COSTS [Das billigste Verkehrsmittel? Kostenvergleich zwischen Schiene und Strasse]**

No Abstract. [German]

*Verkehrswirtschaftliche Informationen* No. 20-1, 76, pp 6-9

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: *Verkehrswirtschaftliche Informationen*, Frankfurt am Main, West Germany

18 157502

**EVALUATION OF THE FINANCIAL ASSUMPTIONS CONTAINED IN THE USRA FINAL SYSTEM PLAN**

This study evaluates the validity of the procedure, analyses and assumptions used by the United States Railway Association in its preparation of the Final System Plan for Conrail. The Committee on Interstate and Foreign Commerce had the responsibility for assessing the USRA Final System Plan and reporting its recommendations to the House of Representatives. The objectives of this Princeton study were to focus on three basic elements of the Plan: (1) economic projections, including traffic network forecasts and projections of future economic conditions and inflation effects; (2) pro forma projections and financial models and data base on which they were based, and (3) the methods of financial assistance proposed, including estimates of future funding requirements and ultimate costs to the government. This analysis does not include recommendations with regard to the Final System Plan.

Prepared for the Committee on Interstate and Foreign Commerce, U.S. House of Representatives.

Princeton University Cong. Rpt. Committee Print 13, Oct. 1975, 96 pp, Figs., Tabs., 6 App.

ACKNOWLEDGMENT: United States House of Representatives

ORDER FROM: GPO

18 157514

**COMPARATIVE APPRAISAL OF FEDERAL INVESTMENT FOR TRANSPORT INFRASTRUCTURES [Vergleichende Bewertung von Verkehrsweginvestitionen des Bundes]**

From the planned provisions of the Federal budget, the authors examine the usual decision-making techniques: cost-benefit analysis, cost-efficiency analysis, and value analysis. They show the advantages of these techniques,

determine the theoretical relations, and show how appraisal of infrastructure investments is carried out in practice. Examples of appraisals enable the reader to follow the reasoning and the phases of calculation. [German]

Fisher, L. *Internationales Verkehrswesen* Vol. 28 No. 1, Jan. 1977, pp 12-25, 1 Fig., 4 Tab.

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

**18 157670**

**AN EXPLANATION OF RAILROAD ACCOUNTING**

The status of railroad accounting methods and a denial of the thesis that they have a major role in the financial problems of the industry are discussed. The ICC has allowed changes in its prescribed accounting methods but the author says that there should be no uniform cost accounting system for the entire industry.

Brinner, HJ (Association of American Railroads) *The Office* Vol. 83 No. 1, Jan. 1976, pp 79-80

ORDER FROM: Office Publications Company, 1200 Summer Street, Stamford, Connecticut, 06904

**18 157948**

**AN ANALYSIS OF FREIGHT CAR INVESTMENT**

This paper is a condensation of a study by the author on optimum freight car investment. He describes the model he has developed in which marginal revenue from a car is a function of the number of cars owned by the railroad, the number of cars in the national fleet, car service rules, per diem charge and car demand. He shows that marginal revenue declines as the number of cars a railroad owns increases, and examines the effects of various policies, such as government purchase of cars and a change in car service rules, on the size of individual fleets.

Included in Freight Transportation: A Digest of Technical Papers, a report sponsored by the Office of the Secretary, U.S. Dot, RRIS 17 144088 7701.

Oiesen, JF  
Transportation Systems Center Tech Paper DOT-TSC-OST-77-68, Oct. 1976, pp 139-147, 1 Fig., 6 Ref.

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

**18 157950**

**OPERATING AND MAINTENANCE COSTS FOR RAIL RAPID TRANSIT**

The prediction of operating and maintenance costs for rail rapid transit systems is treated from two different approaches. A detailed model for estimating those operating and maintenance costs associated with vehicle operation was developed as part of a procedure to optimize rapid transit car design. The model involves the use of many underlying microscopic variables that must be provided as input data. For the early stages of alternative planning and evaluation, a more macroscopic technique, unit cost modeling, is presented and calibrated. While less precise than the first technique, these models can be used to provide quick "order of magnitude" estimates upon which first-cut comparisons may be reasonably based. The relationship between labor productivity indices and unit costs is also explored, although data did not permit a complete treatment of this area.

Roess, RP (Polytechnic Institute of New York); Huss, MF Sokwicklis, C *ASCE Journal of Transportation Engineering* Vol. 103 No. TE3, Proc. Paper 12942, May 1977, pp 421-439, 7 Ref.

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

19 151582

**NORTHEAST HISTORICAL ARCHAEOLOGY, VOLUME IV,  
NOS. 1 AND 2. SYMPOSIUM ON INDUSTRIAL ARCHAEOLOGY  
(1974), PATERSON, NEW JERSEY**

The publication contains 8 papers by members of 2 research teams that had worked in the Great Falls/S.U.M. National Historic District. Subjects include the salvage archeology project conducted in the right-of-way of a 66-inch diameter storm drain and cut through the locomotive-manufacturing area of the GFHD from Interstate 80 and N.J. Route 20 to the Passaic River; the historic evolution of the Rogers Locomotive and Machine Co.; the development of locomotive-building technology; the salvage archeology "observing" on highway construction; the mill architecture in Paterson; the 19th-century workers' housing in the "Dublin" area adjacent to the GFHD; the role of Paterson's silk industry in the 19th-century Atlantic economy; and the construction and development of the GFHD's raceway system.

Rutsch, E Leo, R Cotz, JA Fries, R Morrell, B  
Council for Northeast Historical Archeology, Great Falls Development  
Corporation, Paterson Department of Community Development, Society  
for Industrial Archeology Final Rpt. 1975, 108 pp

ACKNOWLEDGMENT: NTIS

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PB-261768/6ST, DOTL NTIS

19 153063

**TRAMWAYS AND TROLLEYS: THE RISE OF URBAN MASS  
TRANSPORTATION IN EUROPE**

This book is an historical and statistical investigation of the growth of the European electric tramway industry between 1890 and 1910 with primary

focus on France, Germany and Great Britain. Data is evaluated in terms of three basic sociological disciplines: Development, diffusion and public management of technology and innovation; patterns of entrepreneurship and economic activity; and the impact of transportation changes upon the urban environment. Conclusions are drawn concerning these and inferences are made about the future. Discussing technological innovation, it is observed that such movements that have vast consequences for society cannot be allowed to run wildly on the basis of what is presently cheapest and most dependable, without proper regard for long-term cost and related negative consequences.

McKay, JP (Illinois University, Urbana)

Princeton University Press Monograph 1976, 282 pp, 16 Fig., 12 Tab., Refs.

ORDER FROM: Princeton University Press, 41 William Street, Princeton, New Jersey, 08540

ISBN-0-691-05240-9, DOTL HE3812.M33

19 157965

**150 YEARS OF THE B&O**

The sesquicentennial of the Baltimore & Ohio is marked by a history of this pioneer company. The growth and technical innovations of B&O are traced.

Stover, JF (Purdue University) *Railway Age* Vol. 178 No. 8, Apr. 1977, 10 pp, Photos.

ORDER FROM: ESL

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20 131705

**TRUCKING IN 1995**

Comments are made on the conditions that are foreseen for 1995, the demand for motor truck transportation is considered, the means employed to satisfy the demand are discussed, the future of trucking is examined, and recommendations are presented for the benefit of motor vehicle manufacturers. During the next 20 years, higher food and petroleum prices, greater population density, and a shift toward higher labor intensity relative to capital will bring about the substitution of goods for people movement. People will be shopping by cable TV and telephone and goods will be delivered by truck. The demand for private trucking will grow faster than the demand for for-hire trucking because the service sectors will grow faster than the manufacturing sectors. Intermodal freight shipments will become more important. In 1995, trucks will have to haul twice the ton-miles currently handled, and will also have to demonstrate social, economic and environmental improvements. Lighter intracity trucks, streamlined intercity trucks, engines with reduced fuel consumption and emissions, diesel engines, electric trucks, and more economical operations are foreseen. Increased labor intensity with emphasis on conservation of capital, energy and environment will result. The major implications of this scenario to motor vehicle equipment manufacturers are related to the slowing of the growth of the market for motor trucks, the increase in size and decrease in number of motor truck customers, and the increasing specialization of such customers.

Durham, L (Laird Durham Company)  
Motor Vehicle Manufacturers Association, (LADU 7502-C6.12) June 1975, 71 pp, 6 Fig., 6 Tab., 1 App.

Contract LADU 7502-C6.12

ORDER FROM: Motor Vehicle Manufacturers Association, 320 New Center Building, Detroit, Michigan, 48202

DOTL RP

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 Bibliog. Oct. 1976, 114 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PS-760812/8ST, DOTL NTIS

20 146296

**AVAILABILITY OF POTENTIAL COAL SUPPLY THROUGH 1985 BY QUALITY CHARACTERISTICS**

The objective of this study is to determine the availability of uncommitted low-sulfur coal in terms of quantity, quality, and timeliness of production and uncommitted recoverable coal which is potentially available for production. The effects on coal availability of manpower, equipment, availability, economics, ownership, and regulations are considered implicitly by virtue of the responses received in the market survey.

Stinnett, LA Toth, GW Barber, SC Goodman, JB Maltese, J  
NUS Corporation, Federal Energy Administration NUS-1725,  
FEA/G-76/367, Aug. 1976, 121 pp

Contract FEA-CO-05-60574-00

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-256680/0ST, DOTL NTIS

20 146298

**IMPACT OF RISING ENERGY COSTS ON THE DOMESTIC PRODUCTION OF SELECTED COMMODITIES**

The importance of energy in the future of both the United States and, indeed, the world's industrial development cannot be overemphasized. World consumption of energy has increased rapidly in recent years, reflecting the

explosion in world industrial capability as well as the increase in standard of living. The purpose of this study is to determine what effect the increased power costs might have on the production of selected commodities in the United States. The commodities selected for study are: Bituminous coal, iron and steel, phosphate, copper, and oil shale.

Haycocks, C  
Virginia Polytechnic Institute & State University, Bureau of Mines  
BusMines-OFR-88-76, May 1976, 124 pp

Grant G0133086

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-256650/3ST, DOTL NTIS

20 146300

**THE TRANSITION TO COAL**

The basic energy problem facing the U.S. and other industrialized nations is not to secure independence from foreign energy suppliers, but instead to negotiate an orderly transition from primary reliance on fossil oil and gas resources to predominant use of energy sources not tied to finite fuel reserves. This report describes the major energy problem currently facing the United States, and proposes a long-term energy strategy based on increased U.S. coal production. Major environmental, capital, and labor constraints affecting coal demand and production are discussed. A model, that is a tool for designing and testing broad coal-related energy programs is described.

Naill, RF Miller, JS Meadows, DL  
Thayer School of Engineering, National Science Foundation, (No. 2) Ann. Rpt. DSD-18, NSF/RA/N-74/289, Nov. 1974, 51 pp

Grant NSF-SIA72-03454

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-256445/8ST, DOTL NTIS

20 146304

**FEASIBILITY OF CONSIDERABLY EXPANDED USE OF WESTERN COAL BY MIDWESTERN AND EASTERN UTILITIES IN THE PERIOD 1978 AND BEYOND**

This report evaluates the economic impact of western, midwestern and eastern coal competing for the same markets in developing an optimum coal use strategy. A general expansion in the use of surface mined western coal by midwestern and eastern utilities in the period 1978 and beyond is concluded to be economically viable.

Jones, JW Paulsen, TA  
Pittsburgh University, Pittsburgh, Federal Energy Administration  
FEA/G-76-304, Nov. 1975, 61 pp

Contract FEA-CO-05-50259-00

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-256048/0ST, DOTL NTIS

20 146726

**SURVEY OF RADIOACTIVE MATERIAL SHIPMENTS IN THE UNITED STATES**

The survey period was from March 1, 1974, through February 28, 1975. Of over 15,000 NRC and Agreement States licensees, and ERDA prime contractors, 2275 received questionnaire packets. Approximately 59 percent of those recipients responded to the survey; of these respondents, 35 percent reported shipping activities. Based on the number of packages shipped annually, the major nuclides were exp 131 I, exp 125 I, /sup 99m/Tc, exp 99 Mo, and exp 238 U, while those shipped in the greatest amounts (grams or curies) were exp 60 Co, exp 192 Ir, and exp 238 U. The majority of package types shipped were Types A and LS (low specific activity), while the most common modes of transport were rail and truck. The shipping activities of approximately 14,600 minor shippers were estimated to be on the order of 200,000 radioactive packages/year. The combined annual shipping activities of 761 major shippers, SNM licensees, and ERDA contractors who responded were estimated to be approximately 300,000 packages of SNM and Source Material plus 800,000 packages containing nuclides other than SNM or Source Material. There were also about 800,000



packages (mostly exempt) shipped by 21 apparent major shippers who responded to a part of the survey intended for minor shippers. Also, classified data containing information regarding nonweapons shipments indicated 850 packages. The possibility of using the survey data for projection use was briefly investigated.

Simmons, JL Cloninger, MO Cole, BM Medford, AE  
Battelle Memorial Institute/Pacific Northwest Labs, Energy Research  
and Development Administration. Apr. 1976, 316 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

BNWL-1972, DOTL NTIS

**20 146746**

**STUDY OF THE ECONOMIC IMPACT OF SULFUR REGULATIONS PROMULGATED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY FOR OHIO ON AUGUST 27, 1976. STUDY DOCUMENT NUMBER 10. COAL PRICES USED IN STUDY OF ECONOMIC IMPACTS OF SULFUR OXIDE REGULATIONS IN OHIO**

This report presents as input data estimates of delivered coal prices to Ohio by sulfur content, especially the estimated price premium for low sulfur over high sulfur coal. Described are recent coal price trends in terms of appropriateness for the regulatory compliance by Ohio coal users.

Also available in set of 11 reports as PB-259800-SET, PC E99/MF E99.

Energy and Environmental Analysis, Incorporated, Environmental  
Protection Agency EPA/905/5-76/010, Sept. 1976, 64 pp

Contract EPA-68-01-4101

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-259811/8ST, DOTL NTIS

**20 147376**

**FORECAST OF REVENUE FREIGHT CARRIED BY RAIL IN TEXAS TO 1990**

Revenue tons of freight carried by rail in Texas have been forecast to 1990 using multiple regression analysis and trend analysis. Data were gathered on the dependent variable (revenue tons of freight carried by rail in Texas) and on twenty-nine independent variables (economic indicators of the Texas economy) for the base period 1950 to 1972. Forecasts for each of the ten selected variables were computed for 1975, 1980, 1985, and 1990 by extrapolating a chosen trend curve. These forecasted values were then substituted into the regression equation to yield forecasts for the tons of revenue freight carried by rail in Texas.

Williams, DL  
Texas University, Austin, Department of Transportation Res. Rpt.  
RR-24, DOT/TST-75/139, Apr. 1975, 53 pp

Contract DOT-OS-30093

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261320/6ST, DOTL NTIS

**20 147391**

**FREIGHT CAR DEMAND INFORMATION AND FORECASTING RESEARCH PROJECT. PHASE I**

The report describes the features and requirements of an improved demand information and forecasting system. The following conclusions were reached: the level of demand is inadequately measured; shipper demand is highly variable, often ranging from plus or minus 50 percent of the average; because of the high purchase price of freight cars, it is prohibitively expensive to respond to these short-term variations in demand by maintaining a sufficient inventory of empty cars to accommodate the highest level of demand at each location; the time lag to recognize and react to change results in many orders being filled late and some amount of business lost to alternative transportation modes; and the size and the impact of the time lag can be reduced if potential surplus and deficit areas can be predicted and car flows adjusted to reduce imbalances before they occur. A demand information and forecasting system is being designed and evaluated on the basis of this study.

Minger, WK Williams, DJ Hargrove, MB  
Association of American Railroads, Federal Railroad Administration  
Final Rpt. FRA/OPPD-76/9, Mar. 1975, 189 pp

Contract DOT-FR-30058

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261473/3ST, DOTL NTIS

**20 147405**

**THE ALASKA RAILROAD'S FUTURE FREIGHT MARKET. VOLUME I**

The study forecasts the freight market of The Alaska Railroad (ARR) due to natural resource development and pipeline construction in Alaska. This has been done through: (a) Evaluation of those resources with commercial development potential which could generate rail service demand; and (b) development and analysis of petroleum development schedules and pipeline construction scenarios. Detailed price and market analyses of Alaskan coal and copper resources were performed. Forecasts of ARR traffic were based upon econometric relationship between the Alaska economy and petroleum royalties and construction expenditures. Volume One contains the Executive Summary. It describes the study scope and methodology, and highlights ARR's recent experiences, the Alaskan economy, and resource development status.

Hillegas, BD Pernela, LM Lewis, DC  
CONSAD Research Corporation, Federal Railroad Administration Final  
Rpt. FRA/ARR-77/01-1, FRA-RP-301, June 1976, 76 pp

Contract DOT-FR-4-3010

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262461/7ST, DOTL NTIS

**20 148593**

**AN EXPERIMENT IN FREIGHT MODAL CHOICE: DELINEATING THE RAIL-TRUCK INTERFACE**

The market for transportation of manufactured goods which was sampled divides into two segments: a "natural" market for railroads, and a "natural" market for trucking. The major dividing line is an exponentially increasing function of the value of the commodity (per pound) and the distance it is shipped. Railroads, of course, handle the lower-valued goods, but a certain amount of volume within the rail market cannot go by rail because of susceptibility to damage or the lack of rail sidings. Both markets exhibit some degree of rail-truck competition. Twenty percent of the truck market is handled by rail, primarily because trucks lack the capacity. Thirty percent of the rail market is handled by truck because of the shipment size or rail service deficiencies in terms of speed and reliability. The rail market represents the major arena for competition because it is twice the size of the truck market. A model of freight modal choice provides the user with a concrete means of determining where a given type of traffic fits. It consists of a set of decision rules and a set of statistical models for estimating probability of the traffic moving by a given mode. Two types of strategies exist for switching freight between the modes. One type is investment intensive and seeks to reduce modal cost levels or remove operating bottlenecks. The other type is related more to information and technique dissemination. Included here are efforts to change shipment size, optimize shipper and receiver logistical costs, and improve carrier service.

This report was sponsored by the Office of the Secretary, Office of University Research, DOT.

Stenger, AJ Cunningham, WHJ  
Pennsylvania Transportation Institute, (PTI 7608) Final Rpt.  
DOT-TST-76-83, May 1976, 129 pp, Figs., Tabs., 25 Ref., 3 App.  
SPONSORING AGENCY:

Contract DOT-OS-50120

ACKNOWLEDGMENT: TSC  
ORDER FROM: NTIS

DOTL NTIS

**20 148627**

**STRIPPABLE COAL RESOURCES OF COLORADO**

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.

Speltz, CN  
Bureau of Mines No. 8713, 1976, 75 pp, 123 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**20 148628**  
**MINEABLE COAL RESERVES OF MISSOURI**

New estimates of Missouri's coal resources show total coal resources of 49 billion tons. Of this total, 12.3 billion tons is classed as a remaining reserve and 3.7 billion tons is a strippable reserve. Missouri possesses ample coal to support an expanded coal mining industry, according to new estimates. The immediate primary use of Missouri coal will continue to be for firing mine-mouth steam-electric power plants. Eventually, a more important use may be conversion to other fuels, including pipeline gas, solvent refined coal, low Btu gas and liquid petroleum substitutes. Remaining reserves are classified according to sulfur content. Data indicate that no significant areas of low-sulfur coal are present in Missouri. Approximately half of the state's coal reserve contains from 4 to 5 percent sulfur, and one-fourth has from 3 to 4 percent sulfur. Less than one-tenth contains less than 3 percent sulfur and the remainder more than 5 percent.

Robertson, CE *Missouri Geological Survey & Water Resources Rept Rpt.* No. 54, 1973, 71 pp, 12 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**20 149179**  
**NEW PLANNING TOOL FOR CARGO TRANSPORTATION IN FOREIGN TRADE**

This paper provides some highlights of new research methods and applications that were developed at the Port Authority of New York and New Jersey in foreign trade transportation. The accomplishments of this research have strongly demonstrated the usefulness of new kinds of data on the domestic origins and destinations of U.S. foreign trade. Some of the illustrations of application provided by the authors include aspects such as definition and analysis of the New York port hinterland for exports and imports and the implication to port planners, analysis of modal interface at the port and its importance in recognizing potential operating problems such as traffic congestion, implementation of specific economic studies to appraise the possible impact of international economic developments on the port, and refinement of econometric forecasting techniques of foreign trade mass shipped. These applications have proved highly significant for the New York port by enhancing planning efforts in both the short term and the long term. Some of the important findings pinpointed in this paper are the existence of a strong direct relationship between the value of cargo and the distance such cargo travels inland to and from the port, the division of inland transportation markets by modes (trucks predominate in all nearby territories and railroads are strong in more distant markets such as the Midwest), and the existence of a greater degree of dispersal for the port's export cargo origins compared to its import destinations. The paper points out other potentially useful applications in the transportation field based on the experience of the New York port. /Author/

Gilbert, J. Ilan, A (Port Authority of New York and New Jersey)  
*Transportation Research Record* No. 591, 1976, pp 7-11, 6 Tab., 1 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

**20 149186**  
**TRUNK ROUTE ANALYSES: A USEFUL TOOL FOR STATEWIDE AND REGIONAL RAIL PLANNING**

The underlying purpose in developing and applying a trunk route analysis procedure was to (a) prepare reliable estimates of traffic likely to use the various main lines that make up a rail system and (b) transform resulting traffic flows into estimates of railroad costs and revenue on the basis of links, nodes, corporate systems, and regional rail systems. The objective is to

identify the overall effect of proposed changes in facility usage, routings, and corporate ownership through identification of the difference between the current system and alternative plans. The developed procedure used traffic assignment principles applied to rail freight. Key steps involved (a) establishing geographic and physical facility characteristics, (b) obtaining traffic and revenue data, (c) preparing the various inputs (physical characteristics of links, zone-to-zone traffic, and likely routings), and (d) assigning traffic and calculating associated costs and revenues by using a specially prepared computer program. The procedure, developed for the Pennsylvania Department of Transportation, was used to evaluate the United States Railway Association's Preliminary Systems Plan (for reorganizing bankrupt railroads in the Northeast and Midwest) and a simple plan proposed by the Commonwealth of Pennsylvania. The resulting procedure helps fill the void for rapid, large-scale tools for policy and systems level planning. Although developed for statewide and regional rail planning purposes, the procedure and supporting computer program are general enough to permit their application to other freight modes of an intercity character. /Author/

Memmott, FW Scholz, FS (Creighton (Roger) Associates, Incorporated)  
*Transportation Research Record* No. 591, 1976, pp 44-50, 3 Fig., 6 Ref.

ORDER FROM: TRB Publications Off

**20 149400**  
**SCRAP DEMAND VERSUS NEWLY AVAILABLE SUPPLY: 1975-1985**

The paper details the methodology and presents preliminary findings of a study to assess the demand for scrap and the supply of newly available ferrous scrap in the U.S. Total scrap demand is determined from assumptions of raw steel production, foundry shipments and leached copper production. Mill and foundry production is used to determine revert scrap generation. Prompt industrial scrap is estimated from mill and foundry shipments to consuming industries. Shipments of these consuming industries are used to estimate ferrous waste becoming available in the period due to obsolescence. Geographic distributions are based on appropriate industry and government census data.

Included in the Proceedings of the Mineral Waste Utilization Symposium, 5th, held in Chicago, April 13-14, 1976.

Nussbaum, RF (Kearney (AT) Incorporated)  
Bureau of Mines Proceeding 1976, pp 342-349

ACKNOWLEDGMENT: EI  
ORDER FROM: Illinois Institute of Technology, Research Institute, Chicago, Illinois, 60616

**20 149401**  
**MINI-MIDI MILLS SHOW LARGER AMOUNT OF CLOUT**

Growth and performance of the mini-and midi-steel mills-- there are about 70 of them in the United States--are examined in the light of economic and technical advantages that these smaller mills offer. The economic distinction is made between these cold-charge mills (melting steel scrap or pre-reduced pellets) and the big, integrated mills. Operations of some major United States' cold-charge steelmakers are reviewed, and it is concluded that, despite some problems, the mini-midi-mills display a great ability to survive and grow. The long-term outlook for these mills is briefly discussed.

Bennett, KW *Iron Age* Vol. 218 No. 15, Oct. 1976, 16 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**20 149408**  
**THE IMPACT OF PULPWOOD RAIL FREIGHT COSTS ON THE MINNESOTA- WISCONSIN PULPWOOD MARKET**  
No Abstract.

Lothner, DC  
Forest Service Res. Rpt. A 13.79:NC-215, 1976, 3 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO (77-49)  
ORDER FROM: Forest Service, North Central Forest Experiment Station, Folwell Avenue, St. Paul, Minnesota, 55101

20 149447

**HOW EXTENDING RIVER NAVIGATION INTO KANSAS AND CENTRAL OKLAHOMA WOULD AFFECT TRANSPORTATION COSTS OF FERTILIZER. AN ANALYSIS OF FINDINGS**

This study projects for 50 years, beginning with 1990, the volume of fertilizers handled for Nebraska, Kansas, Oklahoma and portions of Colorado and Texas by a proposed extension of the present Arkansas River canal system to Wichita and/or Oklahoma City. Maximum volume over the period is forecast as 55.9 million tons with maximum transportation "savings" seen as \$158.2 million discounted at an annual compound rate of 5.625%. Origin and destination volumes are forecast.

Prepared for the Army Corps of Engineers, Tulsa District, and in cooperation with the Kansas Corporation Commission, Tennessee Valley Authority, USDA Economic Research Service and others.

Phillips, R. Sorenson, LO Schruben, LW  
Kansas State University Res. Rpt. No. 561, Sept. 1974, 61 pp, 7 Fig., 19 Tab., 3 App.

Contract DACW-73-C-0046

ACKNOWLEDGMENT: Army Corps of Engineers  
ORDER FROM: Kansas State University, Department of Agricultural Economics, Experiment Station, Manhattan Kansas, 66506

DOTL RP

20 149459

**WHEAT SHIPMENTS FROM KANSAS, 1972-1973**

This report summarizes data on shipment of wheat from Kansas local and terminal elevators from July 1, 1972, through June 30, 1973--a wheat marketing year with wheat export sales substantially higher than expected, resulting in transport equipment shortages and shipper distress. Rail shipments accounted for 92.5% of total movement. Kansas local elevators shipped 60% of their product to Kansas millers and terminal elevators and 40% to out-of-state destinations. Kansas terminal elevators made 94.2% of their shipments by rail. Four companies originated 92.7% of rail shipments; on all seven Kansas lines participating in wheat haulage main line stations originated 52.6% of shipments. Rates were predominately single-car basis, although some multiple-car and trainload rates were applied.

This work was sponsored by the Transportation Research Center, U.S. DOT.

Sorenson, LO  
Kansas State University Res. Rpt. No. 575, Dec. 1974, 47 pp, 2 Fig., 25 Tab., 3 Ref.

Contract DOT-TSC-799

ACKNOWLEDGMENT: TSC  
ORDER FROM: Kansas State University, Department of Agricultural Economics, Manhattan, Kansas, 66506

DOTL RP

20 149985

**POWDER RIVER BASIN DEVELOPERS AIM AT 86 MILLION TPY BY '85**

The outlook for developers of western coal in Wyoming's Powder River Basin is examined in the wake of a Supreme Court decision in favor of the industry. Some companies are stepping up development activities while others are adopting a more cautious approach. The Basin's coal developers have set their sights on a production target of 86 million tpy by 1985, but this production goal will depend on new transport facilities, including both railroad and slurry pipeline projects.

*Coal Age* Vol. 81 No. 9, Sept. 1976, 4 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

20 150412

**FUELS AND ENERGY DATA: UNITED STATES BY STATE AND CENSUS DIVISIONS, 1973**

Salient information on reserves, production, and consumption of fuels and energy by State is summarized in this Bureau of Mines publication. Reserve and production data are shown for each of the fossil fuels (coal, crude oil, natural gas liquids, and natural gas) and for uranium. The consumption data

of each of the major consuming sectors (household-commercial, industrial, transportation, electric power, and miscellaneous) are broken down by energy source (coal, petroleum, natural gas, hydropower, and nuclear). In addition, total energy consumption in the Nation in 1973 is compared with consumption in 1972 and 1974 (preliminary data).

Crump, LH  
Bureau of Mines BuMines-IC-8722, Dec. 1976, 121pp, 8 Fig.

ACKNOWLEDGMENT: Bureau of Mines, NTIS  
ORDER FROM: GPO, NTIS  
S/N-24-004-01892-5, PB-262362/7ST, DOTL NTIS

20 150413

**PROJECTS TO EXPAND FUEL SOURCES IN EASTERN STATES. SURVEY OF PLANNED OR PROPOSED COAL MINES, COAL AND NONCOAL CONVERSION PLANTS, ELECTRIC GENERATING PLANTS, OIL REFINERIES, URANIUM ENRICHMENT FACILITIES, AND RELATED INFRASTRUCTURE, IN STATES EAST OF THE MISSISSIPPI RIVER (AS OF JUNE 1976)**

This Bureau of Mines report comprises tables listing the name, location, and other pertinent data concerning certain future fuel-related projects. The tables include information on projects involving the proposed or planned development of fuel resources, as well as the development of storage, transportation, and conversion facilities; the report covers the 26 States east of the Mississippi River. Of the total 594 projects for which information is provided, 492 concern coal mines and electric generating plants.

Bureau of Mines BuMines-IC-8725, Dec. 1976, 121 pp, 27 Fig.

ACKNOWLEDGMENT: Bureau of Mines, NTIS  
ORDER FROM: GPO, NTIS  
S/N-024-004-01891-7, PB-262361/9ST, DOTL NTIS

20 150527

**ENERGY USE PATTERNS IN METALLURGICAL AND NONMETALLIC MINERAL PROCESSING (PHASE 7-SUMMARY OF THE RESULTS OF PHASES 4, 5, AND 6)**

This report summarizes energy content of 83 metallic and nonmetallic nonfuel commodities derived from mineral deposits subdivided into high-priority (14 commodities), intermediate-priority (27 commodities), and low-priority (42 commodities). It includes summary tables on energy content per ton of product and total energy equivalent for U.S. 1973 consumption for each commodity and a total energy required table grouping high-, intermediate-and low-priority commodities into energy content for each stage from mining to final processing. The last table compares the requirements by source of energy for each priority grouping.

Supplement to report dated 27 Jun 75, PB-245 759 and report dated 16 Sep 75, PB-246 357. See also PB-261 152.

Battelle Columbus Laboratories, Bureau of Mines Final Rpt. BuMines-OFR11776V2, Sept. 1976, 31 pp

Contract S0144093

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-261151/5ST, DOTL NTIS

20 150535

**A WESTERN REGIONAL ENERGY DEVELOPMENT STUDY: ECONOMICS. VOLUME II. SRI ENERGY MODEL DATA BASE**

This report examines the economics of 38 energy resource development scenarios. The supply analysis looks at capital investments and operating costs for extracting, converting, and transporting all forms of energy. The data were placed in a computer model along with a projection of U.S. energy demands to the year 2000. Vol. II presents the data base.

Sponsored in part by Environmental Protection Agency, Washington, D.C., Energy Research and Development Administration, Washington, D.C., and Department of the Interior, Washington, D.C. See also Volume I, PB-260 835.

Stanford Research Institute, Council on Environmental Quality, Environmental Protection Agency, Energy Research and Development Administration, Department of the Interior, (SRI-4000) Final Rpt. Nov. 1976, 231 pp

Contract EQ5AC007  
 ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-260836/2ST, DOTL NTIS

**20 150550**  
**A TRANSPORTATION MODEL FOR THE UNITED STATES**  
**COAL INDUSTRY**

A general economic model is developed using linear programming methodology to minimize the cost of coal shipments in the United States. A more sophisticated recursive model is then specified to allow model solutions through time as well as the incorporation of the dichotomous coal market structure. The model is applied through time under varying assumptions of coal demand and sulfur dioxide emission regulations. The results indicate significant differences in flows and shadow values under alternative assumptions. Model solutions suggest intensive development of western coal reserves with the existence of sulfur restrictions.

LeBlanc, MR  
 Cornell University, National Science Foundation MA Thesis A.E.  
 Res-76-10, NSF/RA-760300, July 1976, 229 pp

Grant NSF-SIA74-21846

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-260367/8ST, DOTL NTIS

**20 151183**  
**THE ALASKA RAILROAD'S FUTURE FREIGHT MARKET.**  
**VOLUME II**

The study forecasts the freight market of the Alaska Railroad (ARR) due to natural resource development and pipeline construction in Alaska. This has been done through: (a) evaluation of these resources with commercial development potential which could generate rail service demand; and (b) development and analysis of petroleum development schedules and pipeline construction scenarios. Detailed price and market analysis of Alaskan coal and copper resources were performed. Forecasts of ARR traffic were based upon econometric relationships between the Alaskan economy and petroleum royalties and construction expenditures. Volume Two inventories Alaskan natural resources. It includes detailed coal and copper evaluations, describes petroleum related growth and development in Alaska, and contains schedules of petroleum production, employment, state revenues, and pipeline construction employment by scenario.

See also Volume 1 dated Jun 76, PB-262 461.

Hillegas, BD Pernela, LM Lewis, DC  
 CONSAD Research Corporation, Federal Railroad Administration Final  
 Rpt. FRA/ARR-77/01-2, June 1976, 211 pp

Contract DOT-FR-4-3010

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-263366/7ST, DOTL NTIS

**20 151583**  
**UTAH COAL FOR SOUTHERN CALIFORNIA POWER: THE**  
**GENERAL ISSUES**

The establishment of coal-fired power-plants sited outside the State of California for the benefit of Southern California residents raises a number of problems which are not entirely resolved. Issues considered are: (1) those arising from the use of Upper Colorado River Basin surface water in the production of energy, (2) those arising from the degradation of air quality in the area where the plants are sited, (3) those arising from the choices for the mode of transportation of the energy from the producer region to the consumer region, and (4) those arising from the socioeconomic impact on the producer region.

Prepared by California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.

Anderson, OL  
 Lake Powell Research Project, California University, Los Angeles,  
 National Science Foundation Bull-13, NSF/RA/E-75-181, Nov. 1975, 86  
 pp

Contract NSF-AEN72-03470-A03

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-261680/3ST, DOTL NTIS

**20 151866**  
**THE ALASKA RAILROAD'S FUTURE FREIGHT MARKET.**  
**VOLUME III**

The study forecasts the freight market of the Alaska Railroad (ARR) due to natural resource development and pipeline construction in Alaska. This has been done through: (a) evaluation of those resources with commercial development potential which could generate rail service demand; and (b) development and analysis of petroleum development schedules and pipeline construction scenarios. Detailed price and market analysis of Alaskan coal and copper resources were performed. Forecasts of ARR traffic were based upon econometric relationships between the Alaskan economy and petroleum royalties and construction expenditures. Volume three provides a detailed review of ARR's recent freight market, pipeline construction scenarios and other activities which could significantly affect the ARR, and provides forecasts of the Alaska Railroad's freight traffic through 1990.

See also Vol. 1 and Vol. 2, RRS 20 147405 and 151183, Bulletin 7702.

Hillegas, BD Pernela, LM Lewis, DC  
 CONSAD Research Corporation, Federal Railroad Administration Final  
 Rpt. FRA/ARR-77/01-3, June 1976, 172 pp

Contract DOT-FR-4-3010

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-264646/1ST, DOTL NTIS

**20 152634**  
**WAGONLOAD REVIVAL ON A TRAINLOAD RAILWAY**

BR's wagonload business now accounts for less than a fifth of tonnage moved but the introduction of high-capacity air-braked wagons provided a fresh opportunity in 1972 to introduce trainload service standards for carefully selected flows of wagonload traffic, mostly between private sidings. These trains should be carrying 4 million tonnes a year by 1979 and the potential may be 20 million tonnes, provided the original concept of isolating specific trunk flows and minimising shunting can be preserved.

*Railway Gazette International* Vol. 133 No. 1, Jan. 1977, pp 13-16, 1 Fig., 1 Tab., Photos.

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

DOTL JC

**20 152665**  
**TRANSPORTATION RATES AND THE RECYCLING PROBLEM**

This paper examines transportation rates for recycled materials and the development of regulatory policies concerning these rates. Government policy has emphasized transportation rates because of their potential for influencing markets for recyclables. The current thrust may encourage materials conservation without taking into account the financial health and resource consumption of the transportation system. A policy that would minimize movement of recyclable commodities might be preferable.

Schary, PB (Oregon State University) *Transportation Journal* Vol. 16 No. 3, Mar. 1977, pp 46-56, 2 Tab., 29 Ref.

ORDER FROM: ESL

DOTL JC

**20 153989**  
**WESTERN COAL TRANSPORTATION: UNIT TRAINS OR**  
**SLURRY PIPELINES**

This report focuses on one commodity, coal, and two modes of transportation, railroads and slurry pipelines. The competition between railroads and slurry pipelines for the transportation of coal mined in the West is examined in depth, as is the impact that institutional and regulatory constraints may have on the competition.

Sargent, A  
 Massachusetts Institute of Technology, Department of Transportation  
 Final Rpt. DOT/TST-76T/26, Aug. 1976, 93 pp

Contract DOT-OS-30104

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264916/8ST, DOTL NTIS

**20 154117**  
**INLAND EMPIRE ECONOMIC BASE STUDY. VOLUME I.**  
**NATURAL RESOURCE BASE ANALYSIS**

The study contains an analysis and inventory of the key natural resources within the Inland Empire. The location and possible market distribution of the principal natural resources--agriculture, forestry and mining are discussed in this volume. The region's most important natural resource presently and probably for years to come is agriculture. Centered in the Inland Empire's Washington and north central Idaho counties, the area is known for its dry-land wheat, its potatoes and sugar beets and its vegetables. Recreation must be considered as having nearly the greatest potential for future growth of all the region's resources. As a whole the area has potential to use knowledge and technology to draw from the earth its abundant and available natural resources.

Prepared in cooperation with Economics Research Associates, Los Angeles. Also available in set of 6 reports PC E14, PB-263 821-SET.

Spokane Area Development Council, Economics Research Associates,  
Economic Development Administration EDA-77-046, July 1976, 170 pp

Grant EDA-07-6-01523

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263822/9ST, DOTL NTIS

**20 154122**  
**SOLID WASTE DISPOSAL-A PLAN OF ACTION**

Analysis of the solid waste disposal problem in the City of Newark, New Jersey and plans for the solution of this problem are discussed. This plan of action looks at potential advantages and disadvantages of solid waste disposal alternatives, including landfill, rail haul, incineration, material recovery, and energy recovery. Resource recovery is recommended as the best alternative for Newark at the present time and various resource recovery systems are discussed in detail. Other factors such as system economics, steps for construction of a facility, and financing of such a facility are all discussed.

Liss, GB  
Newark Department of Engineering Final Rpt. SWP-NK-12-75, Dec. 1975, 294 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263678/5ST, DOTL NTIS

**20 154391**  
**ECONOMIC ADJUSTMENT PLAN FOR OKALOOSA COUNTY,**  
**FLORIDA**

Economic dislocation and adjustment problems created by the plant closure of the Texas Instrument plant formulated a comprehensive economic adjustment plan for the area. The manufacturing strategy proposes two site improvement projects to enhance the growth potential of the industrial parks located at Fort Walton Beach and Crestview. The conversion of a center into a child care facility would serve the needs of the females seeking employment--especially heads of households. The fact that Okaloosa County had no railroad service, the transportation strategy suggests a project to study the feasibility of extending rail service into the area.

West Florida Regional Planning Council, Economic Development Administration EDA-77-026, 1977, 103 pp

Contract EDA-04-09-01341

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263188/5ST, DOTL NTIS

**20 154589**  
**SUPPLY AND DEMAND FOR UNITED STATES COKING COALS**  
**AND METALLURGICAL COKE. WITH A SECTION ON**  
**FOREIGN TRADE IN COKING COALS**

This report gives the known quantities of premium-grade coking coals in each state and compares estimated current production of coking coals with the requirements of domestic coke producers. Also, demand for metallurgical coke in the United States in 1985 is projected.

Sheridan, ET Markon, G  
Bureau of Mines Spec Pub. BuMines-SP-9-76, Dec. 1976, 30 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262743/8ST, DOTL NTIS

**20 156243**  
**AMERICAN COAL INDUSTRY--ITS STRUCTURE AND**  
**FINANCING**

This study illuminates the activities of 21 selected coal mining companies, including their subsidiaries or affiliates, which were responsible for more than half of the total U.S. coal production in 1973. The selected coal firms are not necessarily coal producers per se. Many of the larger producers are classified by the financial institutions as petroleum, metal, and steel producers, public utilities, or chemical industries. Coal produced by steel producers, public utilities, and chemical companies is known as captive production; such coal is used as one of the ingredients for the end product. Today, about 65% of the nation's total coal production is consumed by electric power utilities and 26% by steel, space heating, and other industries; the balance of 9% is exported. This paper discusses financial approaches utilized to evaluate the economic health of the coal industry and suggests rates for return necessary to attract capital required to meet emerging coal demand.

Presented at the AIME Annual Meeting, 104th, in New York, New York, 16-20 February 1975.

Johnson, RE (Department of the Interior); Tomimatsu, TT *AIME Council of Economics, Proceedings* Proceeding Feb. 1975, pp 119-132

ACKNOWLEDGMENT: EI  
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**20 156901**  
**DOES MINE-MOUTH MAKE SENSE FOR WESTERN COAL?**

The author points out that siting a coal-fired, electrical power generating plant has become a delicate business. This was spotlighted in Utah in the past year when two California utilities withdrew their long standing proposal to build a 3000-MW, mine-mouth generating plant in remote Kaiparowits. The highlighted question is, therefore--where should the coal be burned...at the mine-mouth, so that the energy produced is transmitted to the demand area via high voltage line; or should the coal be transported to be burned in the demand area itself? Until most recently, if one considered urban air pollution, land costs, water availability, on the one hand, and transmission line costs, rights of way, coal transportation charges, on the other, the cost/benefit ratio might indicate mine-mouth made sense--depending of course upon how one costed out pollution, land costs and water (these costs are seldom quantified, and for good reason... it's very difficult). In any case, lack of sufficient quantities of water where it is needed, plus the resistance of coal producing states to bearing the brunt of pollution while other states benefit are now the major obstacles to the mine-mouth concept.

*Energy* Vol. 1 No. 4, June 1976, pp 8-11

ACKNOWLEDGMENT: EI  
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**20 156915**  
**WHAT CARTER'S ENERGY PLAN WILL MEAN TO THE**  
**RAILROADS**

President Carter's energy program can result in more coal traffic for railroads and also higher diesel fuel costs. The AAR has considered various coal traffic options, seeing the need for investment of up to \$6 billion for 13,400 cars and 670 locomotives yearly over the next 8 years. Energy options that could affect railroads and the historical and projected levels of railroad coal handling are described.

Ichniowski, T *Railway Age* Vol. 178 No. 9, May 1977, pp 16-19, 2 Fig., 2 Tab.

ORDER FROM: ESL

DOTL JC

20 157227

**CONFERENCE PROCEEDINGS: "AMERICA'S FREIGHT SYSTEM IN THE 80'S AND 90'S...BUT HOW TO GET THERE?"**

This document contains the proceedings from a two-day conference sponsored by the U.S. Department of Transportation (DOT), Transportation Systems Center (TSC), the DOT Office of R&D Policy, and the Federal Railroad Administration called "America's Freight System in the 80's and 90's...but how to get there?" The Conference was held at TSC in Cambridge, Massachusetts on December 1-2, 1976. Its focus was primarily on future technology needs, opportunities, and priorities in the context of major long-range economic and social concerns. Through discussion and debate, the conference objectives were to stress long-range technological needs in intercity freight, high profitability, high-payoff areas, the need for more technological research and application, and ways of overcoming economic and institutional barriers to technological development. The speeches, remarks, and papers of the conference participants appear in this document.

Sponsored by the Offices of the Secretary, Assistant Secretary for Systems Development and Technology, and Research and Development Policy, and co-sponsored by the Federal Railroad Administration, Office of Policy and Program Development, U.S. DOT. See also RRIS 21 144087 7701 "America's Freight System in the 80's and 90's...But How To Get There?", for additional materials prepared in advance of this conference.

Coulombre, RE

Transportation Systems Center, (DOT-TSC-OST-77-40) Proceeding DOT-TSC-OST-77-40, June 1977, 193 pp, Figs., Tabs., Photos., Refs.

ACKNOWLEDGMENT: DOT

ORDER FROM: NTIS

DOTL NTIS, DOTL RP

20 157592

**THE FUTURE RAIL HAUL OF COAL**

One of the major problems that will result from even a partial switch from gas and oil to coal is that of transporting the coal. How fast, how economically, how efficiently can railroads bring the coal from the mines to the energy-producing consumer. Pt. 1 addresses itself to this problem.

Briggs, RE (Association of American Railroads) *Transport 2000* May 1977, pp 22-23, 1 Phot.

ACKNOWLEDGMENT: Transport 2000

ORDER FROM: Intermodal World, Incorporated, One World Trade Center, Suite 1927, New York, New York, 10048

20 157669

**COAL TRANSPORTATION CAPABILITY OF THE EXISTING RAIL AND BARGE NETWORK, 1985 AND BEYOND**

Congested railways and waterways could hamper coal transport and increase the cost of coal use. Projected growth in coal traffic and in other rail traffic "would overload many of the network links on the shortest path from origin to destination," the report states. It is concluded that new cost models should be developed for the movement of coal, combining them with the FRA model to evaluate the total cost of alternative routing. The value of increasing the capacity of direct routes and of waterway improvements can then be assessed.

Report reviewed in the ASME Journal of Mechanical Engineering, V99 N4, April 1977, p 20.

Electric Power Research Institute EA-237, 1977

ORDER FROM: Electric Power Research Institute, EPRI Records and Reports Center, P.O. Box 10412, Palo Alto, California, 94303

20 157914

**THE REGIONAL STRUCTURE OF TRANSPORT IN THE GERMAN FEDERAL REPUBLIC IN 1970 AND 1990. FREIGHT TRAFFIC DEMAND [Die regionale Struktur des Verkehrs in der Bundesrepublik Deutschland in den Jahren 1970-1990. Gueterverkehrsnachfrage]**

No Abstract.

144

Luendorf, P *DIW-Wochenbericht* Vol. 43 No. 42, 1976, pp 386-389, 3 Tab., 1 Phot., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Deutsches Institut fuer Wirtschaftsforschung, Konigin-Luise-Strasse 5, 1000 Berlin 33, West Germany

20 157941

**TRANSPORTATION PATTERNS OF PRODUCTION AND CONSUMPTION**

The author uses formulae to express commodity flows between production and consumption centers, according to the physical production and consumption potentials of the centers and the spatial impact of transportation.

Included in Freight Transportation: A Digest of Technical Papers, a report sponsored by the Office of the Secretary, U.S. DOT, RRIS 17 144088 7701.

Hassler, FL

Transportation Systems Center Tech Paper DOT-TSC-OST-77-68, Oct. 1976, pp 11-28, 23 Fig., 9 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: TSC

20 157942

**ANNUAL AND QUARTERLY MODELS OF FREIGHT TRANSPORTATION AGGREGATES**

This paper presents models for long-term and short-term forecasts for various transport modes, discusses results from the models, and plans for their improvement. The author considers that for policy analysis, these models can serve as bases on which to evaluate the impact of change in certain macroeconomic variables, such as the GNP and production indices of certain specific industrial products such as coal and ore, on the behaviour of these transportation aggregates.

Included in Freight Transportation: A Digest of Technical Papers, a report sponsored by the Office of the Secretary, U.S. DOT, RRIS 17 144088 7701.

Wang, GH

Transportation Systems Center Tech Paper DOT-TSC-OST-77-68, Oct. 1976, pp 30-41, 6 Fig., 4 Tab., 16 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: TSC

20 157945

**EVALUATING TECHNOLOGICAL INNOVATIONS FOR FUTURE INTERCITY FREIGHT SYSTEMS**

The TSC has been conducting a comprehensive study on freight transportation. The initial phase produced a systematic characterisation of the available modal services in terms of cost and service attributes, and their ability to meet users' needs. Any proposed innovation in one or several modes should be evaluated in terms of carrier profitability, market satisfaction and public benefits, while giving full consideration to the potential performance of competing services. The author proposes four levels of evaluation of a system innovation, by means of four models of increasing accuracy and detail.

Included in Freight Transportation: A Digest of Technical Papers, a report sponsored by the Office of the Secretary, U.S. DOT, RRIS 17 144088 7701.

Maio, DJ

Transportation Systems Center Tech Paper DOT-TSC-OST-77-68, Oct. 1976, pp 107-114, 1 Fig., 1 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: TSC

20 157947

**INTERNATIONAL STEAM COAL: THE NEW ENERGY**

A proposal for a world-wide network serving major population centres (United States, Europe, Japan) with coal from large coal deposits near water routes is presented. The authors examine the cost of transport by rail and by waterway and stress the advantages of the latter.

Included in Conference Papers on Advance Freight System Technology: "America's Freight System in the 80's and 90's...But How To Get There?",

RRIS 21 144087 7701. See also Conference Proceedings, RRIS 20 157227 7702.

Wasp, EJ Derammelaere, RH  
Transportation Systems Center Conf Paper Oct. 1976, pp 119-140, 1 Phot.

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

**20 157949**

## **A PRELIMINARY ESTIMATE OF THE IMPACT OF THE IMPLEMENTATION OF FIVE PROPOSED COAL SLURRY PIPELINES**

The paper presents the results of a preliminary analysis on the implementation of five proposed coal slurry pipelines, totalling 4,320 miles in length, with an annual throughput capacity of about 85 million tons. The document gives water and energy consumption, steel tonnage and capital investment costs for the system. It also gives estimated receipts from user charges, and impact on the rail system through revenue loss, loss of rail employment and reduced rolling stock requirements.

Included in Freight Transportation: A Digest of Technical Papers, a report sponsored by the Office of the Secretary, U.S. DOT, RRIS 17 144088 7701.

Mergel, J Vance, L

Transportation Systems Center Tech Paper DOT-TSC-OST-77-68, Oct. 1976, pp 177-185, 1 Fig., 3 Tab., 25 Ref.

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

**20 159489**

## **ANALYZING VERSUS FORECASTING INDUSTRIAL PROSPECTS: THE CASE OF STEEL**

This paper has reviewed some of the key factors affecting the long run outlook for steel consumption, production, prices, costs, capital requirements and profits. Attention was drawn to some non-economic as well as economic considerations likely to influence actual adjustment patterns.

Gold, B (Case Western Reserve University) *Iron and Steelmaker* Vol. 4 No. 3, Mar. 1977, pp 24-34, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL



21 141132

**BULK SERVICE QUEUES: WITH APPLICATION TO TRAIN ASSEMBLY TIMES**

This mathematical study considers the queuing problem associated with assembly of outboard trains. Tables summarize the formulas for the mean and variance of the queue length and waiting time distributions in classification yard operations.

This work was supported by CIGGT Project 5-10.

Petersen, ER

Canadian Institute of Guided Ground Transport No. 71-2, Aug. 1971, 22 pp, Tabs., 7 Ref.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

21 146727

**SAFETY AND ECONOMIC STUDY OF SPECIAL TRAINS**

A comparative evaluation is being conducted of the safety and economics of special (35 mph and less) and regular trains for shipment of spent fuels. The approach, pertinent considerations, and results to date are discussed. The preliminary conclusion is that special train requirements have potential for only a small reduction in the accident likelihood, while increasing the cost. (ERA citation 01:022911)

Transportation for the Nuclear Industry, Minneapolis, Minnesota, 25 May 1976.

Loscutoff, WV Hall, RJ

Battelle Memorial Institute/Pacific Northwest Labs, Energy Research and Development Administration CONF-760548-2, 1976, 21 pp

Contract E(45-1)-1830

ACKNOWLEDGMENT: NTIS

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BNWL-SA-5770, DOTL NTIS

21 148580

**MEASURES AGAINST SNOW DAMAGE**

With 35% of Japanese National Railways routes subject to snow problems such as power failures, derailments and line blockages, JNR has developed numerous solutions. Described are slide prevention installations, snow fences, switch heaters, snow melting installations, and various types of snow plows. JNR also has standardized criteria for operation to prevent lines from being blocked by stalled trains.

Kikuchi, I (Japanese National Railways) *Japanese Railway Engineering* Vol. 16 No. 1, 1975, pp 7-10, 1 Fig., 5 Tab., 8 Phot.

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DOTL JC

21 148585

**NEWLY DEVELOPED EQUIPMENT TO MEASURE OVER-OR UNBALANCED LOADINGS OF FREIGHT CARS**

Japanese National Railways has simulated freight car derailments on a test track designed for this purpose. Major problems have been encountered with two-axle cars as freight trains have been speeded up. In 1956 a system was developed to detect unbalance in such cars, but this required trains to traverse the scales at low speeds. This article describes a new installation which can be traversed by trains moving 45 km/h. The details of the system for detecting overloaded and unbalanced cars in a JNR classification yard are detailed.

Jimbo, K (Japanese National Railways) *Japanese Railway Engineering* Vol. 16 No. 2, 1976, pp 6-9, 4 Fig., 3 Tab., 2 Phot.

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DOTL JC

21 148586

**AUTOMATED MARSHALLING YARDS UTILIZING LINEAR INDUCTION MOTOR**

Automation of yard operations is a major problem for many of the world's railways in the course of modernizing freight movement. To control the speed of cars on yard tracks, the JNR has developed a system of linear

induction motors that was put in service in September 1974, achieving for the first time a complete automation of yard operation. This article presents briefly the system and describes the installations of linear motors for acceleration and deceleration of cars.

Seki, N (Japanese National Railways) *Japanese Railway Engineering* Vol. 16 No. 2, 1976, pp 4-6

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DOTL JC

21 148597

**PROCEEDINGS MANUAL. FREIGHT CAR UTILIZATION SEMINAR**

This Seminar, held in Chicago in November 1976, indicates what the research of the Freight Car Utilization Research Demonstration Program had produced to that time. The Subjects: Preliminary Lessons of Freight Car Utilization Research; Improving Utilization: Buffer Storage, Freight Car Scheduling from an Operating Man's View, Improving Car Control; Strategy for Utilization Improvement; Fleet Sizing; Utilization Performance Evaluation; Car Movement and Distribution.

Association of American Railroads, Federal Railroad Administration Proceeding AAR-R-253, FRA/OPPD-77/4, Dec. 1976, 180 pp

ACKNOWLEDGMENT: AAR, NTIS

ORDER FROM: NTIS

PB-264923/4ST, DOTL NTIS, DOTL RP

21 148599

**A SPECIAL TRACK PROFILE FOR RECEPTION AND DEPARTURE SIDINGS IN FREIGHT YARDS [Special'nyj profil priemootpravochnyh puteij]**

The article discusses the principle of designing the track profile when constructing or modernising freight yards, so as to provide a dip in the track to prevent moving wagons from over-running the length of the reception or departure siding. It is proposed to include standards for this profile in the "Instructions for the design of railway freight yards and centres". [Russian]

Rudanovskij, VM Guseva, KG *Zheleznodorozhnyi Transport* No. 5, 1976, pp 44-45, 3 Fig., 1 Tab.

ACKNOWLEDGMENT: UIC

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo Bassmanaya ul. 4, Moscow B-174, USSR

21 148831

**SPECIFIC CHARACTERISTICS OF THE CALCULATION OF THE NUMBER AND LENGTH OF MARSHALLING YARD TRACKS [Osobennosti rasceta cisla i dliny putej na sortirovochnyh stancijah]**

On the basis of the analysis of the use of reception and departure sidings in marshalling yards, this article gives recommendations for calculating the most economical and rational number of tracks in reception and departure sidings; instructions for improving track utilization; a method for calculating the optimum length of these tracks. [Russian]

Sotnikov, EA *Zheleznodorozhnyi Transport* No. 9, 1976, pp 32-35, 4 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Zheleznodorozhnyi Transport, Novo-Basmanaya ul. 4, Moscow B-174, USSR

21 149180

**PERISHABLES TRANSPORTATION: A FRESH LOOK AT TRAILER ON FLATCAR AND CONTAINER ON FLATCAR**

This paper summarizes research on the economic feasibility of using a dedicated intermodal (highway-rail-highway) service to move produce from the West Coast to the Midwest and the East. From government statistics and interviews with growers and food industry personnel, the study identifies a volume of traffic sufficient to conduct a pilot operation of a dedicated train from the West Coast to the Chicago area on a year-round basis. The dedicated train should originate from the San Joaquin Valley or Sacramento area during the late spring, summer, and fall and from the Yuma area during the remainder of the year, thus serving growers within 160 to 240 km (100 to 150 miles) of the origin rail terminal. Points as far east as New York and

Boston could be served from the Chicago-area rail terminal. The cars and locomotives should be supplied by the railroads, but trailers and containers to perform the service should be supplied and controlled by a shippers' association formed to represent the users of the service. In most situations, the proposed service would be economically competitive, faster, and more reliable than existing truck movement in spite of an assumed 100 percent empty return of equipment. Additional cost-reducing opportunities for the proposed service are discussed in the paper, as are areas requiring further study. /Author/

Leilich, RH (Peat, Marwick, Mitchell and Company) *Transportation Research Record* No. 591, 1976, pp 12-17, 2 Tab., 1 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

21 149379

**THE EVOLUTION OF THE UNIT TRAIN 1960-69**

Much useful data on the economic forces behind the development of unit trains in the USA are assembled in this research paper. By adopting new operating methods rail was able to retain coal traffic threatened by slurry pipelines, pithead power generation and even nuclear power. Many other products were subsequently moved by unit trains, and rail's share of inter-city freight was maintained at over 40 percent as a result. Unfortunately, the period studied excludes the energy crisis of 1973-74 which improved long-term prospects for unit train coal traffic significantly.

Starr, JT  
Chicago University Monograph No Date

ORDER FROM: Chicago University, Department of Geography, South University Avenue, Chicago, Illinois, 60637

21 149392

**A STRONG, STEADY ARM PERMITS UNLOADING A 100-CAR UNIT TRAIN IN 4 HOURS--GENTLY**

A new unit coal train run from Gillette, Wyo., to La Cygne, Kans., is getting under way in conjunction with the initial operation of an advanced train positioner/car dumper that uses an entirely new concept for train holding. The system incorporates an over-the-coupler holding arm. It is designed to absorb forces at the car coupler, along the draft line, rather than at the wheels or trucks.

Ellsworth, K *Railway Age* Vol. 177 No. 18, Sept. 1976, pp 20-21

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

21 149395

**ROUTE CONSTRAINED FLEET SCHEDULING**

This paper attempts to provide some insight into the structure of a large class of fleet scheduling problems. Scheduling under fixed due date constraints is shown to be easily solved using a new formulation of the problem. Scheduling under flexible due date constraints is shown to be inherently complex, and strong evidence is given for asserting that no efficient (polynomial bounded) algorithm exists for solving this problem exactly. A fast heuristic approach is described which has worked well in some school bus scheduling applications.

Orloff, CS (Princeton University) *Transportation Science* Vol. 10 No. 2, May 1976, pp 149-168, 28 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

21 149460

**RAIL TRANSPORTATION REQUIREMENTS FOR COAL MOVEMENT IN 1980**

This rail-oriented coal transportation study is one of a series conducted by the Department of Transportation to identify and quantify transportation requirements for energy materials. Information provided by these studies will be used by government and industry to examine and shape present and future transportation policies and related resource allocation decisions. The primary objectives of this study are to develop and present rail industry estimates of the amount of coal that will move by rail in 1980, the additional

equipment and facilities required to handle the increased traffic, and the associated lead times involved. Other key report objectives are to describe present coal flows, associated operational policies and practices, and the interfaces with connecting or continuing modes of transportation. When possible, 1974-1980 comparisons for these factors are made to illustrate the magnitude and direction of expected changes in levels of operations, distribution patterns, etc.

This work was sponsored by the Office of Transportation Energy Policy and the Transportation Systems Center of the U.S. DOT.

Anderson, J Desai, SA  
Input Output Computer Services, Incorporated Final Rpt. DOT-TSC-OST-76-32, Dec. 1976, 256 pp, Figs., Tabs., Phots., 5 App.

Contract DOT-TSC-1000

ACKNOWLEDGMENT: DOT, NTIS  
ORDER FROM: NTIS

PB-265466/3ST, DOTL NTIS, DOTL HE2321.C6D38C.6

21 149947

**THE SIGNIFICANCE OF INTERMODAL TRANSFER TECHNIQUES IN INLAND CONTAINER TRANSPORT**

Since road and rail transport account for most of the cost of inland container movements, whereas terminal standing accounts for most of the transit time, measures to attract additional traffic should seek to reduce dwell time in terminals and to lower the unit costs of the road and rail stages. Traffic in the 200-400 km distance bracket might offer the best prospects for growth in response to lower unit costs. Equipment in Freightliner terminals is generally well matched to the throughput levels of 1973; increased throughput may be achieved by further investment either in large cranes or in existing or novel types of ancillary equipment. Some examples are given of re-equipment possibilities for particular terminals. Early growth may be expected in the use of small containers for goods distribution. Longer term growth of standard container traffic will depend on the adaptability of the system to local needs and on its convenience and economy for the private and public operators of road transport. Further work is suggested. (A) /TRRL/

Bunce, JA Lynam, DA  
Transport and Road Research Laboratory, (0305-1315) Supp. Rpt. SR 243, 1976, 77 pp, 26 Fig., 7 Tab., 15 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 224029)  
ORDER FROM: TRRL

21 149969

**FULL-SCALE MECHANISATION OF LOADING AND UNLOADING OPERATIONS ON THE SOVIET RAILWAYS [Kompleksnaja mekhanizacija progruzocno-razgruzocnyh rabot]**

The article presents developments and future prospects as regards the full-scale mechanization and automation of loading and unloading operations carried out by the railways. It studies the different aspects of the mechanization plan for goods handling, as contained in the tenth five-year plan (1976-1980), as well as the means for improving this handling. [Russian]

Orlov, VG *Zheleznodorozhnyi Transport* No. 10, 1976, pp 5-11, 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Zheleznodorozhnyi Transport, Novo-Basmanaya ul. 4, Moscow B-174, USSR

21 149980

**THE EFFECTS OF THE AMOUNTS OF TRAFFIC AND OTHER FACTORS ON LATE RUNNING ON PARTICULAR SECTIONS OF LINE [Die Abhangigkeit der Verspatungen auf einer Eisenbahnstrecke von der Streckenbelastung und weiteren Einfullgrossen]**

After describing the problem, the author establishes what these effects are and how extensive they are using statistical methods based on daily operating controls. [German]

Zehme, I *Eisenbahntechnische Rundschau* Vol. 25 No. 11, Nov. 1976, pp 687-692, 5 Fig., 2 Tab., 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

21 149994

**MORE VOLUME AT THE RIGHT PRICE**

After dropping out of the market three years ago, Chessie System has re-entered the long-haul piggyback business. The success of its piggyback service is based on dependability, regularity and adequacy of car supply. Marketing methods of the Merchandise Traffic Department are outlined. Looking to the future, Chessie Traffic officials see increased block movements and runthroughs to improve service and equipment utilization. Coal traffic is regarded as a growth area.

Roberts, R *Modern Railroads/Rail Transit* Vol. 32 No. 2, Feb. 1977, pp 70-73, 5 Phot.

ACKNOWLEDGMENT: CNR

ORDER FROM: Cahners Publishing Company, Incorporated, Watson Publications, 5 South Wabash Avenue, Chicago, Illinois, 60603

DOTL JC

21 149998

**ANATOMY OF SUCCESS**

The success of the Chessie system is the result of many factors, among which are the diversity of its operations and the importance of coal transportation. Coal represents 40% of the Chessie's business, making it the largest U.S. rail carrier of coal. Freight operations are facilitated by efficient yard operations; a new automated yard jointly serving the B&O and the C&O is being built in Cincinnati. The structure of the company--divisional profit centers-- is also regarded as an important element in the organization's success.

Roberts, R *Modern Railroads/Rail Transit* Vol. 32 No. 2, Feb. 1977, pp 66-69, 4 Phot.

ACKNOWLEDGMENT: CNR

ORDER FROM: Cahners Publishing Company, Incorporated, Watson Publications, 5 South Wabash Avenue, Chicago, Illinois; 60603

DOTL JC

21 151267

**CRITIQUE AND RESPONSE TO COAL TRANSPORTATION. A PORTION OF THE COAL FUTURE: ECONOMIC AND TECHNOLOGICAL ANALYSES OF INITIATIVES AND INNOVATIONS TO SECURE FUEL SUPPLY INDEPENDENCE**

In May 1975 the final report of a study titled "The Coal Future: Economic and Technological Analysis of Initiatives and Innovations to Secure Fuel Supply Independence" (See EAPA 2:574) was released to the public. This study examined numerous potential problems that could prevent the expanded use of coal. The chapter title "Coal Transportation" addressed a subject being debated in both the public and private sectors of the Nation. Subsequent to release of the final Coal Future Study, the National Science Foundation received a critique of the Coal Transportation (IV) section. The critique had been prepared by L.E. Peabody and Associates, Inc. for Energy Transportation Systems, Inc. The University of Illinois research team (who made the study) was asked to examine the L.E. Peabody and Associates critique, and to provide their response. This report contains both the L.E. Peabody and Associates, Inc. critique and the University of Illinois response. The issue of alternative models of coal transportation is of continuing major public and private interest. Therefore, public dissemination of opposing perspectives on the coal transportation issue should provide the research community and the public with an opportunity to arrive at their own conclusions. It is hoped that open examination and debate of these issues of national importance will lead to resolution of the differences and ultimately provide a better basis for setting long-term energy policies in the national interest. (ERA citation 02:005227)

National Science Foundation, Energy Research and Development Administration NSF-76-13, 1975, 22 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NSF-RA-N-75-0371, DOTL NTIS

21 151336

**RAILROAD SERVICE IN NORTHEAST PENNSYLVANIA (22 COUNTIES)**

The objectives of the study were: To maintain rail service to all major markets and sources of raw materials; to provide direct service to major gateways; to improve the quality of service with frequent switches to industry and rapid car movements; to sustain profitable carriers and render bankrupt carriers viable; to ensure adequate revenue for rail carriers; develop an efficient, modern plant, including an adequate car supply; to ensure continued operation of important lines through subsidy or other substantive means; consider the community and environmental impact which would result from a loss of rail service; and to identify rail routes which justify operation of passenger trains necessary to fulfill economic and social needs.

Prepared in cooperation with Gellman Research Associates, Inc., Jenkintown, Pa., Smith (Wilbur) and Associates, Columbia, S.C., and Northern Tier Regional Planning and Development Commission, Towanda, Pa.

Northeastern Pennsylvania Economic Develop Council, Gellman Research Associates, Incorporated, Smith (Wilbur) and Associates, Northern Tier Regional Planning & Development Comm, Economic Development Administration EDA-76-084, Oct. 1975, 238 pp

Grant EDA-01-6-09726-26

ACKNOWLEDGMENT: NTIS

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PB-261884/1ST, DOTL NTIS

21 151748

**RAILROAD CLASSIFICATION YARD TECHNOLOGY. A SURVEY AND ASSESSMENT**

This report documents a survey and assessment of the current state of the art in rail freight-car classification yard technology. The major objective was the identification of research and development necessary for technological improvements in railroad classification yards. This involved a projection of future classification yard needs and a comparison of these requirements of existing technology. Separate tasks included a description of the hardware, costs, performance characteristics, and operational practices of existing yards; formulation of general yard-network interaction concepts; collection of in-depth background information concerning the yard population in the United States (categorized by type, technology, and function); estimation of the demands likely to be placed on the nation's network of freight-car terminals during the foreseeable future; and an assessment and prioritization of those areas of terminal operations that warrant further research or development.

See also RRIS 21 127705 7601.

Petracek, SJ Moon, AE Kiang, RL Siddigee, MW Stanford Research Institute, Transportation Systems Center, Federal Railroad Administration, (SRI-3983) Final Rpt. DOT-TSC-FRA-76-35, Jan. 1977, 343 pp

Contract DOT-TSC-968

ACKNOWLEDGMENT: NTIS

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PB-264051/4ST, DOTL NTIS

21 152400

**CHOOSING A RATIONAL CONTROL TECHNIQUE FOR A GRAVITY MARSHALLING YARD [Auswahl der rationellen Steuerungstechnik fuer eine Ablaufanlage]**

Sufficiently precise models of operations can be worked out by calculating the frequency with which these operations occur and the time required for obtaining information and processing it in order to resolve the various control problems involved. [German]

Hofmann, U *DET Eisenbahntechnik* Vol. 24 No. 9, Sept. 1976, pp 413-416, 5 Fig., 2 Tab., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

21 152429

**IMPROVEMENT OF COUPLING-UP PERFORMANCE IN AUTOMATIC MARSHALLING YARDS: A SIMULATION**

Simulation of marshalling yard operations has been developed, representing a significant advance over previous simulations. With emphasis on the frequency of overspeed (potentially damaging) impacts, it was validated using traffic and layout data from an actual yard. It reveals the dependency of overspeed impacts and poor track utilization on retarder release-speed policy and on the profile of the classification tracks. It is readily adapted to other yards and traffic flows. Features of the Monte Carlo approach include nine classification tracks, dual humpleads, realistic traffic flow features, interactions between moving cuts. The simulation program is in FORTRAN IV. Trial runs on a representative yard configuration indicate that substantial improvements are possible through use of a retarder release-speed policy employing velocity information in addition to that on position, and an altered gradient profile.

Contributed by the Rail Transportation Division of the ASME for presentation at the Joint ASME-IEEE Railroad Conference held in Washington, D.C., March 30-April 1, 1977.

de Vries, GH Kerr, CN (Queen's University, Canada)  
American Society of Mechanical Engineers Conf Paper Paper 77-RT-8,  
Mar. 1977, 8 pp, 9 Fig., 1 Tab., 10 Ref.

ACKNOWLEDGMENT: ASME

ORDER FROM: ESL

DOTL RP

21 152456

**HUMPING INSTALLATIONS IN MARSHALLING YARDS WITH SEMI-CONTINUOUS REGULATION OF SPEED FROM THE HUMP BY DOWTY RETARDERS [Ablaufanlagen von Rangerbahnhöfen mit quasi-kontinuierlicher Geschwindigkeitsregelung der Abläufe durch Dowty-Retarder]**

After describing test requirements and procedure, the author discusses the results of dynamic running tests with cuts of wagons over the hump. The tests were carried out by the CFF. [German]

Koenig, H *Eisenbahntechnische Rundschau* Vol. 25 No. 9, Sept. 1976, pp 551-561, 1 Fig., 6 Tab., 1 Phot., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

21 152622

**HOW FEC RUNS SHORT TRAINS AT A PROFIT**

Alone among Class 1 railways in the US, the Florida East Coast has broken free from the stranglehold of work rules and invested heavily in automation as well as high quality track. The result is an operating ratio of 69 in a region with little heavy industry to generate bulk traffic, and one of the best safety records in the country. Low train crew costs make fast and frequent service economical, and the number of staff is increasing as traffic grows.

*Railway Gazette International* Vol. 133 No. 1, Jan. 1977, pp 16-18

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

21 152624

**EFFECT OF PARALLEL TRAIN SPLITTING OPERATIONS ON MARSHALLING YARD OPERATING RESULTS [Vlijanie paralelnogo rospuska na pokazateli raboty stancii]**

This article is based on experience at the Orekhovo-Zuevo yard on the Moscow network and in it, there is an examination of the conditions under which train splitting operations can be done on two trains at once. Results are given for the study into the effect this type of process has on the time needed to form trains, the time locomotives are stationary in the reception sidings and on improvements in gravity hump and sorting siding throughput. [Russian]

Ratkin, MI *Zheleznodorozhnyi Transport* No. 1, 1977, pp 27-30, 2 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

21 152628

**INFLUENCE OF LOCOMOTIVE ADHESION COEFFICIENTS ON THE THROUGHPUT CAPACITY AND FREIGHT TRAFFIC FLOW ON A TRACK SECTION [Vlijanie rascetnogo koefitsienta sceplenija lokomotiva na provoznuju sposobnost' ucastka]**

The author examines the various problems related to these two factors. He concludes that the locomotive adhesion coefficient must be fixed only after a thorough examination of the problems of determining the weight and speed of freight trains and taking account of the effect of a change in adhesion on line operating conditions. Depending on operation conditions and regulations, the criterion for selecting the adhesion coefficient on a section of track could be that of allowing for the highest possible volume of traffic, or making the best use of locomotives, or yet again, aiming for minimum expenditure for rolling stock and other financial aspects. [Russian]

Potapov, AS *Vestnik Vniizt* No. 8, 1976, pp 1-5, 3 Fig., 1 Tab., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

21 153370

**FREIGHT CAR CLEARINGHOUSE EXPERIMENT. EVALUATION OF THE FIRST YEAR OF OPERATION**

The freight Car Clearinghouse Experiment which was started in September 1974 is still in operation. It is a cooperative undertaking by the Southern, Missouri Pacific, and Milwaukee Railroads to improve car utilization. These railroads have been granted a temporary exemption from Car Service Rules 1 and 2 to allow these railroads to use each other's cars as though they were their own. The principal results of the evaluation of the first year of operation are: (1) the Clearinghouse has reduced empty car movements by about 5 million car miles which has an economic value of \$700,000 at 14¢ per car mile; (2) the economic value of expected future benefits from the continued operation of the Clearinghouse as presently constituted is about \$800,000 per year in car day benefits and \$640,000 per year in car mile savings; and (3) because of the success of this Clearinghouse Experiment, seven additional railroads have now joined, bringing total membership to ten.

Sponsored by the FRA's Office of Policy and Program Development, U.S. DOT, and prepared through the FRA/AAR Car Utilization Program. See also RRIS 21 139447 7701 and 24A 152669 7702.

ADD Systems, Association of American Railroads, Federal Railroad Administration AAR-R-259, FRA/OPPD-77-2, Feb. 1977, 91 pp

Contract DOT-FR-65146

ACKNOWLEDGMENT: NTIS

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PB-265206/3ST, DOTL NTIS

21 156880

**OPERATIONS RESEARCH AS AN AID TO REDUCING WAGON CONNECTION TIMES AT COMPUTER-CONTROLLED MARSHALLING YARDS**

In transport undertakings, dispositions hitherto made directly by human agency can be objectified by EDP with the many possibilities of optimizing decision-making. Such decision aids are being developed at present in various sectors. The main instrument of scientific operations control is optimal planning (operations research), i.e., the use of mathematical methods for preparing optimal decisions. [German]

Gobertshahn, R Weigand, W *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 89-96

ACKNOWLEDGMENT: British Railways

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

DOTL JC

21 156899

**RAIL CONTAINER HANDLING--GETTING ON THE RIGHT TRACK**

J. D. Billington, former chief engineer of one of the pioneers of the rail container transport, Freightliners Ltd, outlines the development of rail container handling systems. The discussion principally concentrates on portal cranes, favored for road-to-rail transfer. The earliest types were 0-4-0

(i.e., four lanes between the legs). The need to keep the road vehicle lane outside the portal frame led to the development of cantilever cranes of 2-6-2 and 2-6-3 configurations, in which the portal frame straddles six lanes and cantilever extensions enable the lifting mechanism to cover two or three more lanes at each end. In large terminals, particularly where container storage is provided, more-mobile cranes may be required. The front loader, side loader, and straddle-carrier types are discussed. When comparing running costs, there can be no doubt that the portal crane is by far the cheapest and easiest to maintain. It is also the most reliable.

*Cargo Systems International* Vol. 4 No. 1, Jan. 1977

ACKNOWLEDGMENT: EI  
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21 157229

**THE PRODUCTIVITY OF THE RAILWAY TRANSPORT SYSTEM**

In face of the expected further increase in freight traffic, this paper analyses the different factors affecting railway utilisation in regard to optimum productivity. As traffic density on the railway lines is a very important element in productivity, optimum utilisation of the railway system is compared to the productivity of a continuous transportation system (pipe-line).

Kochnev, FP Lazaryan, VA *Rail International* No. 3, Mar. 1977, pp 136-145, 7 Fig., 4 Tab.

ACKNOWLEDGMENT: Rail International  
ORDER FROM: ESL

DOTL JC

21 157672

**THE TASK FORCE APPROACH: CHANGE COMES SLOWLY--BUT IT COMES**

The government-industry-labor Task Force on Rail Transportation is in the fourth year of its St. Louis Terminal Project and is now conducting similar activities in Chicago and Houston. From the yard-and-terminal area it will soon expand into line-haul operations with the National Intermodal Demonstration Project. The goals are experimental modification of existing labor agreements and the provision of better service, not necessarily cutting of costs. The conclusion is that problem-solving approaches have evolved which can be used increasingly throughout the industry. It is also proving the labor-management cooperation is possible in improving the quality and efficiency of rail transport.

Welty, G *Railway Age* Vol. 178 No. 11, June 1977, 2 pp, 1 Fig.

ORDER FROM: ESL

DOTL JC

21 157931

**MOUNT NEWMAN: LESSONS OF HEAVY ORE HAULAGE**

The Mount Newman Mining Company operates a single-track line 426 km in length, for moving ore trains from Mount Whaleback to Port Hedland in Northern Australia. It has carried 200 million tonnes of traffic in 6 years. The author highlights the traction, hauled stock, track, and signalling problems arising in this type of operation. He concludes that "imported" technologies must be examined very closely for adaptation to Australian conditions, that the initial prospects must allow for possibilities of further development, and that reliability is an essential factor.

Peake, P *International Railway Journal* Jan. 1977, pp 55-60, Photos.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Simmons-Boardman Publishing Corporation, 508 Birch Street, Bristol, Connecticut, 06010

DOTL JC

21 157934

**THE DIMENSIONS OF SORTING SIDINGS IN FREIGHT MARSHALLING YARDS [Bemessung von Gleisgruppen in Gueterzugbildungsbahnhoefen]**

Expenditure for laying sorting sidings and for their maintenance together with costs for train formation represent the largest portion of overall costs of carload traffic. Through the science of railway operations, a number of methods have been developed for determining the capacity of sorting sidings in marshalling yards. The author describes a stochastic method separately

from marshalling yard timetables which indicates the maximum capacity of sorting sidings. [German]

Strieck, E *Archiv fuer Eisenbahntechnik* Vol. 31 Dec. 1976, pp 46-56, 12 Fig., 4 Tab., 12 Ref.

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

21 158182

**SYSTEMS ANALYSIS OF A RAILWAY NODE TERMINAL FOR A HIGH-THROUGHPUT TRAFFIC SYSTEM FOR CONVEYING LOAD UNITS AND DEVELOPMENT OF ALTERNATIVE CONCEPTS FOR THE APPLICATION OF THE PRINCIPLE OF "HORIZONTAL TRANSSHIPMENT" [System analyse eines Knotenpunktterminals fuer ein Hochleistungsverkehrssystem zum transport von Landungseinheiten und Entwicklung von Konzeptionsalternativen zur Anwendung des Prinzips "Horizontalumschlag"]**

The article summarizes the study commissioned by the German Federal Minister of Transport. This study is contained in 2 volumes. [German]

*Internationales Verkehrswesen* Vol. 26 No. 6, Nov. 1976, pp 319-320

ACKNOWLEDGMENT: International Union of Railways, BD

21 158189

**WASTE DISPOSAL BY CONTAINER TRAIN**

Brief description is given of the agreement between the Greater London Council and B.R. to take trains of refuse from the Solid Waste Transfer Station at Breatford to the landfill site at Appleford in Oxfordshire.

*Modern Railways* Vol. 34 No. 344, May 1977, p 176, 3 Phot.

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Allan (Ian) Limited, Terminal House, Shepperton TW17 8AS, Middlesex, England

DOTL JC

21 158211

**LOCALIZED FEEDBACK CONTROLS FOR MULTI-LOCOMOTIVE POWERED TRAINS**

A model for the longitudinal dynamics of a multi-locomotive-powered train is developed. Using this model, the problem of minimizing coupler forces in the train while maintaining a practical schedule is examined. Controllers developed are easily realized and in one form allow commands for throttle setting changes of remote units: For a trial consisting of remote units, the controllers were found to meet system specifications.

Peppard, LE McLane, PJ Sundareswaran, KK  
Canadian Institute of Guided Ground Transport CIGGT-73-12, Apr. 1974, 27 pp, 9 Fig., 4 Tab., 15 Ref.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

21 158212

**OVER-THE-ROAD TRANSIT TIME FOR A SINGLE TRACK RAILROAD**

This paper models the mean running time for trains in both directions on a single-track railroad. Trains operating at different speeds in each direction are permitted. A priority system is included which prescribes the delay to each train when meets and over-takes do occur.

Petersen, ER  
Canadian Institute of Guided Ground Transport, (Project 5-10) Work Paper CIGGT-71-4, Aug. 1971, 24 pp, 8 Fig., 2 Ref.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

21 159475

**METHODS FOR THE OPTIMIZATION OF THE REGULAR AND SPECIAL TRANSPORT IN LONG-DISTANCE GOODS TRAFFIC**

Because of the intensely fortuitous and also systematic fluctuations of the transport demand, the operational planning of long-distance goods transport which forms a substantial part of the transport output of the European railways, creates considerable difficulties. This article explains the methodical principles for determining the most favourable starting positions for regular and special goods trains as well as the most profitably regular train figures. This method has been converted into a mathematical model, which is at present being used for the first time by the German Federal Railways.  
/Author/TRRL/

Wiegand, K (Technical University of Braunschweig, West Germany) *Rail International Analytic* No. 3, Mar. 1977, pp 146-156, 5 Fig., 10 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-225729)

ORDER FROM: ESL

DOTL JC

22 052933

**STUDY OF A VIBRATION TABLE FOR TESTING PACKING MATERIALS TO BE USED IN THE TRANSPORT OF GOODS IN RAILWAY WAGONS. ENQUIRY REPORT**

No Abstract.

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

International Union of Railways B61/RE/E, July 1962, 13 pp, 2 App.

ACKNOWLEDGMENT: UIC

ORDER FROM: UIC

DOTL RP

22 139364

**GREAT LAKES TRANSPORT OF WESTERN COAL: TECHNICAL AND ECONOMIC ANALYSIS**

An investigation of the economics of transporting western coal to consumers in the midwestern and eastern demand regions with a particular emphasis on the Great Lakes waterborne link. The design characteristics of Great Lakes coal-carrying vessels are discussed in detail. Specific problems involved in the transport of coal in bulk are related to design decisions, particularly in the areas of cargo-handling gear, cubic requirements, ship maneuvering, cargo thawing, and dust control. The relative performance of taconite carriers, specially built colliers, and combination vessels in the coal trade is discussed, together with a consideration of potential problems facing coal carriers diverted to the taconite trade. The economic effects of systematic variations in ship characteristics, including dimensions, materials, proportions, and speed are considered. The impact of fuel price and of operation through the winter is also examined. A comparison of transport alternatives for various pairs of sources and destinations, based on total delivered cost and energy expenditure, including rail transport and transshipment, is made. Conclusions are offered regarding the future of Great Lakes operations in view of the emerging coal traffic.

Elste, VH Scher, RM

Michigan University, Ann Arbor, (No. 182) Final Rpt. MA-RD-940-76061, June 1976, 149 pp, 26 Fig., 21 Tab., 4 App.

Contract 6-38011

ACKNOWLEDGMENT: Maritime Administration

ORDER FROM: NTIS

DOTL NTIS, DOTL VM156.M53no.182

22 146709

**ANALYSIS AND COMPARISON OF TRANSPORTATION SECURITY SYSTEMS**

The role of modeling in the analysis of transportation security systems is described. Various modeling approaches are outlined. The conflict model developed in Sandia Laboratories' Transportation Mode Analysis for the NRC Special Safeguards Study is used to demonstrate the capability of models to determine system sensitivities and compare alternatives. (ERA citation 01:022949)

Transportation for the nuclear industry, Minneapolis, Minnesota, United States of America (USA), 25 May 1976.

Rinne, RL

Sandia Laboratories, Energy Research and Development Administration CONF-760548-1, May 1976, 16 pp

Contract At(29-1)-789

ACKNOWLEDGMENT: NTIS

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SAND-76-8660, DOTL NTIS

22 146710

**ADVANCED PHYSICAL PROTECTION SYSTEMS FOR FACILITIES AND TRANSPORTATION**

Sandia Laboratories is developing advanced physical protection safeguards in order to improve the security of special nuclear materials, facilities, and transportation. Computer models are being used to assess the cost-effectiveness of alternative systems for protecting facilities against external attack which may include internal assistance, and against internal theft or sabotage. Physical protection elements such as admittance controls, portals and detectors, perimeter and interior intrusion alarms, fixed and remotely

activated barriers, and secure communications are being evaluated, adapted, and where required, developed. New facilities safeguards concepts which involve "control loops" between physical protection and materials control elements are being evolved jointly between Sandia Laboratories and Los Alamos Scientific Laboratory. Special vehicles and digital communications equipment have been developed for the ERDA safe-secure transportation system. The current status and direction of these activities are surveyed.

17th Annual Meeting of the Institute of Nuclear Materials Management, Seattle, Washington, 32 June 1976.

Jones, OE

Sandia Laboratories, Energy Research and Development Administration CONF-760615-8, 1976, 16 pp

ACKNOWLEDGMENT: NTIS

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SAND-76-5388, DOTL NTIS

22 146716

**PRESENT AND FUTURE OF RADIOACTIVE TRANSPORT SAFETY**

A critical examination is made of solutions employed for transport of radioactive substances. The degree of safety is considered to be the product of risk of occurrence multiplied by the possible consequences. Both type B and A packaging are discussed. It is felt that the 9-meter drop test of IAEA does not adequately take into account the crashing of an aircraft on the ground. Stricter testing of packaging intended for liquids with high radiotoxicity is also suggested. Integral dose problems and rail and other transport modes are discussed.

Sousselier, Y Cohendy, G

Energy Research and Development Administration No Date, 4p

ACKNOWLEDGMENT: NTIS

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ERDA-TR-130, DOTL NTIS

22 146724

**EXPERIENCES IN TRANSPORTATION OF DRIED LOW-RANK WESTERN COALS**

The Grand Forks Energy Research Center and Commonwealth Edison of Chicago jointly conducted tests in which 400 tons each of subbituminous coal and lignite were dried in a commercial scale dryer, oil sprayed and cooled, then shipped in open-top rail cars from Pekin, IL to Grand Forks, ND and stockpiled. Cars containing raw coal and dried coal that had not been oil sprayed were also transported for comparative purposes. The subbituminous coal was dried from 26 to 16 pct moisture and the heating value was upgraded from 8,420 to 9,650 Btu/lb. The lignite was dried from 39 to 22 pct moisture and its heating value was increased from 6,420 to 8,300 Btu/lb. Before loading, subbituminous coal was cooled at 115 exp 0 F and sprayed with oil at a rate of from 2 to 6 gal/ton. Similarly, lignite was cooled to 85 exp 0 F and oil sprayed at rates of from 1 to 2 gal/ton. The subbituminous coal was subjected to 2 inches of rain during transit with no change in average moisture content. The cars containing dried and oil treated coal had less material lost to wind than either cars containing raw or untreated dried coal. With both dried lignite and subbituminous shipments, a moderate increase in temperature was measured during transit. With the subbituminous shipments, ignition occurred near poorly fitted bottom dump doors, but was limited to a very small area. The dried lignite was shipped when ambient temperatures were below freezing, and frozen coal was noted around the edge of the car. At Grand Forks, the coal was stockpiled using proven techniques and has remained stable to this date. (ERA citation 01:022577)

Meeting of the Society of Mining Engineers, Salt Lake City, Utah, USA, 12 Sep 1975.

Paulson, LE Cooley, SA Wegert, C Ellman, RC

Bureau of Mines, Commonwealth Edison Company, Energy Research and Development Administration 1975, 21 pp

ACKNOWLEDGMENT: NTIS

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CONF-750946-9, DOTL NTIS



22 146855

**MANUFACTURING INDUSTRY SHIPMENTS 1963 ESTIMATES FOR COUNTIES, SMSA'S AND STATES**

This report describes the statistical foundation and actual data development of a comprehensive set of estimates of 1963 shipments of manufacturing industries for all counties in the United States. A theoretical discussion of shipments estimators is presented, along with associated error models. The results of numerical analyses of estimate error are also given. This is followed by a description of data processing procedures used to construct the matrix of best estimates of manufacturing shipments. Finally, there is a discussion of data sources employed in making estimates. /Author/  
Distribution limitation now removed.

Faucett (Jack) Associates Final Rpt. Aug. 1968, 93 pp

Contract DAHC20-67-C-0204

ACKNOWLEDGMENT: NTIS  
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22 146856

**1963 OUTPUT MEASURES FOR INPUT-OUTPUT SECTORS BY COUNTY**

This report documents the development of county measures of 1963 economic output organized according to the sector classifications of the 1958 interindustry study of the Office of Business Economics. Measures of 1963 output, expressed in both 1963 and 1958, dollars, were constructed for the first 79 sectors of the 1958 input-output model. The county production measures are based on previously developed 1963 output measures for metropolitan areas, states, and the nation as a whole. The county production measures prepared by this project are based on previously-developed 1963 output measures for metropolitan areas, states, and the nation. County output was established by first constructing area measures of economic activity closely related to output. National, state, and metropolitan area groupings of these proxy measures were used to calculate coefficients relating output to the proxy series. The coefficients were then applied to county proxy data to construct county output measures. /Author/  
Distribution limitation now removed.

Faucett (Jack) Associates Prog. Rpt. Dec. 1968, 44 pp

Contract DAHC20-67-C-0204

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22 148625

**EASTOVER'S VIRGINIA CITY PLANT MEETS TOUGH STANDARDS**

Maximum recovery of high-quality coal to meet the growing needs of electric power generation keynotes the design of a multi-million-dollar preparation plant described here. Ultra-modern equipment and techniques were utilized in the plant's design to obtain optimum efficiency in extracting the final ounce of coal from the run-of-the-mill product-- even down to 100 mesh size. Engineered for 10,000-ton trains, the plant is claimed to be "one of the most advanced and efficient preparation plants in service anywhere." Primary structures in the preparation plant are: (1) unit train loading station; (3) main plant, containing all cleaning facilities; and (3) raw coal breaking building, containing rotary breaker.

Mason, RH *Coal Mining and Processing* Vol. 13 No. 9, Sept. 1976, pp 50-53

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

22 148626

**MORE RESEARCH NEEDED IN COAL SILO TECHNOLOGY**

The greater need for coal storage silos has generated additional problems, some of which are examined by the author. Highlighted among these are costly unused storage and design problems. Potential solutions are briefly discussed, and it is emphasized that, in the very least, quality control from the drawing table through construction is absolutely essential.

Sadler, JE (Fling (R.S.) and Partners, Incorporated) *Coal Mining and Processing* Vol. 13 No. 5, May 1976, pp 70-72

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

22 149396

**ALGORITHM FOR TRANSPORTATION ROUTING AND VEHICLE LOADING**

A model is formulated and a computationally efficient heuristic procedure for its solution is presented and illustrated. The methodology is applicable to large size problems with multiple stops, commodities, modes of transportation and time periods. Individual vehicles can be routed through a time dimensioned network with the integer nature of the routes preserved. An individual vehicle can carry more than one commodity and trans-shipment is permitted. Constraints on vehicle, node and arc capacities are represented. The objective function can include both operating costs and penalties on early or late arrivals at destinations. Solutions are obtained using a modification of Dantzig-Wolfe decomposition termed "reflection" programming. Large problems require only a few minutes for solution.

Part of the TIMS Studies in the Management Sciences Series, Vol. 1.

Agin, NI (Mathematica, Incorporated); Cullen, DE *Logistics* 1975, pp 1-20, 12 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: American Elsevier Publishing Company, Incorporated, 52 Vanderbilt Avenue, New York, New York, 10017

22 151170

**FACTORS INFLUENCING THE DEMAND FOR GOODS MOVEMENT**

The report identifies the decision-maker who is responsible for making the basic decisions in the goods movement process. An objective function by which the decision maker can measure the relative goodness of an overall logistics strategy is then formulated. It shows the tradeoffs that are possible between those variables over which the decision maker has a choice and their impact on the objective function. A method of searching for optimal strategies is then described.

Roberts, PO

Massachusetts Institute of Technology, Massachusetts Institute of Technology Final Rpt. DOT/TST-77/14, Sept. 1975, 58 pp

Contract DOT-OS-50112

ACKNOWLEDGMENT: NTIS  
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PB-262794/1ST, DOTL NTIS

22 152597

**NEW FRONTIERS IN BULK TRANSFER TECHNOLOGY**

The rational planning of terminals with today's complexity requires operation research and simulation techniques. The PIRTLOG computer program developed for this purpose is capable of simulating the operations of a port complex, and the related ship, barge, railroad or truck input and output. PIRTLOG is utilized in selecting the number, size and capacity of berths and handling equipment, stockpile and inventory requirements, is assessing the effects of fleet distribution and berth availability, for sensitivity analysis of all systems to variations of criteria, and for value engineering analysis, determining the impact of changes in one area on another or on the overall system. To assist in the planning of offshore terminals, the SEABERTH computer program was developed.

Soros, P (Soros Associates, Incorporated) *Iron and Steel Engineer* Vol. 53 No. 12, Dec. 1976, 3 pp, 10 Ref.

ACKNOWLEDGMENT: EI (EIX770300222)  
ORDER FROM: ESL

22 152611

**SOME DEVELOPMENTS AND DISCIPLINES IN UNDERGROUND RAIL TRANSPORT**

The merits of rail traction underground are discussed together with the limitations of existing prime-movers. Two new prime-movers are examined, and the promising liquid-nitrogen engine is described. Various means of dealing with gradients to a steep for ordinary locomotive haulage are considered, and certain aspects of rope haulage which merit special developments are examined. The use of prefabricated fixed-length panels of

conventional track is recommended for gate roads. Reasoned arguments are developed for the adoption of 760 mm track gage as a national standard for new collieries, and similarly recommendations are given for a standard coupling. An important improvement to supplies cars is described. Operational recommendations include a well-disciplined use of loops and pass-byes, and a much wider use of stop lines at fouling points on converging roads.

Lunnon, C (National Coal Board, Doncaster, England) *Mining Engineer* Vol. 136 No. 187, Nov. 1976, pp 113-125, 9 Ref.

ACKNOWLEDGMENT: EI (EIX770300294)  
ORDER FROM: ESL

**22 152667**  
**MEASURING LOGISTICS SYSTEM LOSS AND DAMAGE WITH A SHRINKAGE APPROACH**

Transportation-related loss and damage can represent only a fraction of the total value of goods damaged, destroyed or disappearing in the entire logistics system. A firm may have no measure of the extent of the problem in its own warehouses, factories and private truck fleets. This analysis showed in-house loss and damage is a problem which warrants attention by logistics managers and is one which is amenable to analysis using existing tools and information.

Cavinato, JL (Georgia University, Athens) *Transportation Journal* Vol. 16 No. 3, Mar. 1977, pp 5-13, 1 Fig., Tabs., 3 Ref.

ORDER FROM: ESL

DOTL JC

**22 153059**  
**ALASKA OIL...BY RAIL**

Alaskan oil-supplies will soon be building up on the U.S. West Coast and the railways, through a tank-train concept developed by GATX, will be moving this oil to central U.S. states. The choice of a "moving pipeline" provides an economical and environmentally safe means of moving the crude oil.

*Progressive Railroading* Vol. 20 No. 3, Mar. 1977, pp 71-72, 1 Fig., 2 Phot.

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

DOTL JC

**22 156244**  
**VIBRATORY FEEDERS HELP CONTROL WET WESTERN COAL**  
Multiple feed/handling problems associated with the heavier, denser, high moisture content western coal are being controlled successfully at the Colstrip, Mont. operation of Western Energy Co., through operation of its new coal handling system. The system incorporates heavy-duty vibratory feeders arranged with reciprocating feeders to move coal from the stockpile through a supply tunnel to rail loadout. The system is set up so that any one cluster of five feeders--three vibrating and two reciprocating--can deliver a total of 4000 tons/hr of coal.

*Coal Mining and Processing* Vol. 13 No. 11, Nov. 1976, pp 66-67

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**22 156872**  
**MAMMOTH TRANSSHIPMENT TERMINAL LINKS MONTANA COAL TO MICHIGAN POWER PLANT**

After examining an all-rail haul from Montana to Michigan, Detroit Edison elected for a combination rail/water routing through Superior, Wis., for its low-sulfur Western coal. Details of the Superior coal-handling facility are described. This is an unloading/loading facility which takes coal from unit trains at the rate of 3500 tons/hr and can load Great Lakes colliers at the rate of 11,000 tons/hr. Special attention was given to control of environmental pollution.

Yu, AT (ORBA Corporation) *ASCE Civil Engineering* Vol. 47 No. 1, Jan. 1977, pp 52-55, 9 Phot.

ORDER FROM: ESL

DOTL JC

**22 156903**  
**YARD HAULING: SWITCHING TO RUBBER**

This article explains the advantages of Monsanto Company's using two Clark 280 rubber-tired dozers, equipped with special compressed air braking systems and rail car coupling devices, to move 150 rail cars daily to various locations around its huge phosphorus plant near Columbia, TN.

*Industrial Engineering* Vol. 9 No. 1, Jan. 1977

ACKNOWLEDGMENT: EI  
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**22 156908**  
**ALGORITHMS FOR MINIMIZING TOTAL COST, BOTTLENECK TIME AND BOTTLENECK SHIPMENT IN TRANSPORTATION PROBLEMS**

The paper considers the transportation problem of determining nonnegative shipments from a set of  $m$  warehouses with given availabilities to a set of  $n$  markets with given requirements. Three objectives are defined for each solution: total cost, TC; bottleneck time, BT (i.e. maximum transportation time for a positive shipment); and bottleneck shipment, SB (i.e., total shipment over routes with bottleneck time). An algorithm is given for determining all efficient (pareto-optimal or nondominated) (TC, BT) solution pairs. The special case of this algorithm when all the unit cost coefficients are zero is shown to be the same as the algorithms for minimizing BT provided by Szwarc and Hammer. The algorithm is extended to provide not only all the efficient (TC, SB) solution pairs but also, for each such BT, all the efficient (TC, SB) solution pairs.

Srinivasan, V (Stanford University); Thompson, GL *Naval Research Logistics Quarterly* Vol. 23 No. 4, Dec. 1976, pp 567-595, 16 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**22 156909**  
**GENERAL DESIGN CONSIDERATIONS FOR LARGE WESTERN COAL HANDLING FACILITIES**

The following assumptions are made: (1) that the mine has an annual production of 10 MTPY; (2) that the coal is being hauled by trucks from the pit; (3) that the mine is shipping its product out by unit trains at a price of \$8.00/ton in the car. The basic design parameters, i.e., annual production, life of the project, workdays per week and shifts per day, set the policy for "duty selection" of equipment (light, medium or heavy duty). Using the above assumptions and the basic design parameters this hypothetical facility will require a truck dump, some form of crushing, possible sampling, some type of and amount of storage, weighing, necessary environmental controls and a conveying system to tie it all together.

Presented at the Institute's 72nd Regional Meeting, June 27-30, 1976, in Vail, Colorado.

Bland, RW (Lively Manufacturing & Equipment Company)  
Rocky Mountain Coal Mining Institute Conf Paper 1976, pp 65-68

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**22 157231**  
**HIGH SPEED LOADING OF PALLETISED TRAFFIC**

New thinking in distribution and marketing can reduce handlings and offer fresh opportunities for rail transport. The company-train concept can be extended to palletised and containerised traffic. The author points out that this traffic lends itself to a high degree of mechanisation, resulting in predictable, quick turnaround, and often economy in space and building cost. Moreover some surprising traffics can be unitised. Finally, he suggests that competition in distribution is an extravagance. Might co-operation lead to automation?

Cosgrove, JT (British Railways) *Rail International* No. 2, Feb. 1977, pp 91-96, 7 Fig.

ACKNOWLEDGMENT: Rail International  
ORDER FROM: ESL

DOTL JC

22 157239

**IMPORTANCE OF TRANSPORTATION TO THE IRON AND STEEL PLANT [Die Bedeutung des Transportwesens fuer das Huetttenwerk]**

The importance of the moving of goods, from raw materials to the finished product, to the functioning of a steel plant is reviewed. This includes the most common means and systems of transportation, questions of site, principles of organization, as well as planning, calculation, and control of costs. The necessity for mechanization and automation of transport systems, the realization of detailed material flow plans, and the education and advanced training of skilled staff as well as the comprehensive regulations for the reduction of accidents in accident-intensive transportation processes are pointed out. [German]

Heilig, H Adam, W *Stahl und Eisen* Vol. 96 No. 22, Nov. 1976, pp 1101-06

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

22 157247

**TRANSPORTATION TYPE PROBLEMS WITH QUANTITY DISCOUNTS**

The per unit transportation cost from a specific supply source to a given demand sink is dependent on the quantity shipped, so that there exist finite intervals for quantities where price breaks are offered to customers. Thus, such a quantity discount results in a nonconvex, piecewise linear functional. In this paper, an algorithm is provided to solve this problem. This algorithm, with minor modifications, is shown to encompass the "incremental" quantity discount and the "fixed charge" transportation problems as well. It is based upon a branch-and-bound solution procedure. The branches lead to ordinary transportation problems, the results of which are obtained by utilizing the "cost operator" for one branch and "rim operator" for another branch. Suitable illustrations and extensions are also provided.

Balachandran, V (Northwestern University, Evanston); Perry, A *Naval Research Logistics Quarterly* Vol. 23 No. 2, June 1976, pp 195-209, 11 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

22 157590

**SPOT LOADER TRIALS PROMISE SIMPLIFIED PRODUCT SHIPMENT BY RAIL**

A new rail tanker loading system, now under trial at Phillips-Imperial Petroleum's refinery on Teeside, is described. Known as the Fast Filler, the system eliminates the need for all the complicated pipework and carriage used in other mechanized systems. Instead it uses the principle of the multicolor ball-point pen: the all-rubber flexible probes are lowered vertically from the same housing. Other operating improvements incorporated into the design of the Fast Filler are highlighted, and a cost comparison is made with some other mechanized loading systems.

Cranfield, J *Petroleum Review* Vol. 30 No. 351, Mar. 1976, pp 153-156

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

22 158196

**REPORT TO THE PRESIDENT: AN EVALUATION OF THE EFFECTIVENESS OF THE NATIONAL CARGO SECURITY PROGRAM**

This report, submitted to the President, gives the status of the voluntary cooperation program initiated by DOT to reduce losses of freight in U.S. commerce. The National Cargo Security Program covers all modes of freight transport and details the accomplishments of each mode, the plans for the coming year and specific examples in the modes of improved security and theft investigations. It is noted that railroads face unique difficulties in protecting freight from theft-related losses and damage. New procedures are proposed for shared responsibility by rail shippers.

Direct inquiries regarding the National Cargo Security Program to Daniel A. Ward, U.S. DOT, (202)426-1362.

Adams, B  
Office of the Secretary of Transportation Mar. 1977, 261 pp, 20 App.

ACKNOWLEDGMENT: OST  
ORDER FROM: DOT

22 158203

**FIELD SURVEY STUDY: FREEZING PROBLEMS DURING RAIL TRANSPORT**

A field survey of freezing problems was initiated to obtain information regarding experimental and analytical studies, field trials, product or equipment evaluation, descriptions of the type and severity of freezing problems, current practices and their effectiveness, possible operating cost estimates, and current energy utilization in thawing and/or dislodging frozen bulk materials being shipped by rail during winter. A questionnaire was distributed to companies in Canada, the United States and Europe in order to establish guidelines for the field survey. A summary evaluation was made of the information received. This evaluation formed the basis for the selection of sites to be included in the field survey portion of the program. While the approaches taken at a number of locations in Canada and Scandinavia are detailed in the report, one inescapable and seemingly obvious conclusion resulting from this study is that there does not seem to be a universal solution to freezing problems of bulk materials during rail transportation. It appears that each solution must be individually engineered to meet local conditions and economic requirements.

Sponsored by Canadian National and Canadian Pacific Railways, and by Noranda Mines, Canada.

Colijn, H  
Canadian Institute of Guided Ground Transport, (Project 3.25.75).  
CIGGT-76-12, Nov. 1976, 68 pp, 14 Fig., 3 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

22 158204

**THERMAL CONDUCTIVITY OF COAL**

Thermal conductivity ( $\kappa$ ) measurements on thermal coal from the Corbin Coal Mine, Corbin, B.C., supplied by Byron Coal Mine Ltd., Blairmore, Alberta, were made by the transient head flow probe method at four temperatures, 15, 5, -5 and -15 degrees C, for four moisture contents (m.c.) and two densities ( $\gamma$  sub d). The measured  $\gamma$  sub d ranged from 0.2 W/mK for low m.c. and  $\gamma$  sub d conditions (m.c. = 5.2%,  $\gamma$  sub d = 62.2 lb/sq ft) to 0.3 W/mK for high m.c. and  $\gamma$  sub d conditions (m.c. = 13.2%  $\gamma$  sub d = 70.9 lb/sq ft) at 15 degrees C and the above moisture and density conditions, the range was from 0.17 to 0.34 W/mK. The thermal conductivity was measured separately at four different dry densities in order to find a relationship that would permit the interpolation of thermal conductivities at other densities. A straight-line relationship between  $\kappa$  and  $\gamma$  sub d appeared to best correlate thermal conductivity and density over the density range from 59.7 to 74.9 lb/sq ft. Particle size distribution determinations carried out by dry sieving the coal before and after compaction show particle breakdown was not occurring during specimen preparation and/or freeze-thaw processes. Appendix A contains a linear statistical analysis of the results.

Sponsored by Canadian National and Canadian Pacific Railways and the National Research Council of Canada.

Penner, E (National Research Council of Canada)  
Canadian Institute of Guided Ground Transport, (Project 3.48-75) Final Rpt. CIGGT-76-9, NRC-399, Aug. 1976, 23 pp, 6 Fig., 5 Tab., 2 Ref., 1 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

23 047274

**SUBWAY AERODYNAMIC AND THERMODYNAMIC TEST (SAT) FACILITY- DOUBLE TRACK AERODYNAMICS**

The report is one of many leading to the final product, a "Subway Environmental Design Handbook." The purpose of the report is to present, describe and interpret the test data generated in the SAT Facility (double track, rectangular cross section tunnel, smooth, with a solid dividing wall, 15% porosity curtain wall and open except for periodic columns). In particular, aerodynamic data for 3 trains of blockage ratios varying between .35 and .75 are described for steady and unsteady runs.

See also report dated Aug 72, PB-213 158.

Institute for Rapid Transit, (UMTA-DC-06-0010) Oct. 1972, 74 pp

ACKNOWLEDGMENT: NTIS  
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PB-220807/2, DOTL NTIS

23 090125

**URBAN TRANSPORTATION ALTERNATIVES. A MACRO ANALYSIS**

The objective of the study was to evaluate the relative performance and effectiveness of seven transportation systems deployed on a regional basis: Highway (with limited bus), Comprehensive Bus, Exclusive Bus, Rapid Rail, Dial-A-Ride, Dual Mode, and PRT. The systems were analyzed in a hypothetical scenario reflecting the projected 1990 characteristics of the 30 largest U.S. urban areas (excluding the three biggest) as regards transit ridership, application for which it appears to be most suited, and urban transportation needs.

Benjamin, P Barber, J Heaton, C Paules, G Ward, D  
Transportation Systems Center Final Rpt. DOT-TSC-OST-74-10, Dec.  
1974, 142 pp

ACKNOWLEDGMENT: NTIS  
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PB-238775/1ST, DOTL NTIS

23 093750

**ATTITUDES TOWARD METRORAIL IN THE WASHINGTON AREA**

This report includes the major findings of a study carried out in late winter and early spring of 1975 to assess public attitudes in the Washington area toward the Metrorail system in various stages of its construction in different parts of the community. The study used standard survey research techniques in which samples of the population were interviewed about their transportation habits, their priorities for improvements in local transportation, their views about Metrorail and aspects of its operation, their own prediction about the likelihood of their using the system and their opinions about methods of financing Metro's construction. The interviewing was carried out by the field staff of The Washington Survey, the local research facility of BSSR.

Also pub. as Washington Metropolitan Area Transit Authority, D.C. WMATA-75/26. Prepared in cooperation with Federal City Council, Washington, D.C.

Bureau of Social Science Research, Incorporated, Washington  
Metropolitan Area Transit Authority, Federal City Council BSSR-717,  
June 1975, 85 pp

ACKNOWLEDGMENT: NTIS  
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PB-245569/9ST, DOTL NTIS

23 130414

**RAIL TRANSIT-CHARACTERISTICS, INNOVATIONS, AND TRENDS**

Rail transit, including streetcar, light rail, rapid transit, and regional rail, is a family of transportation modes with a broad range of service, operational, and cost characteristics. Consequently, these modes may be used efficiently for various conditions. As a result of numerous technological and operational innovations of rail systems during the last two decades, rail transit can be highly automated, reliable, and comfortable and can operate with minimal environmental intrusion. Although several U.S. systems (e.g., Lindenwold Line and Bay Area Rapid Transit) have some advanced features, general knowledge and understanding of rail systems in this

country lag behind those of some western European countries and Japan. Based on a comparison of the population characteristics of selected European and U.S. cities, this paper shows that, among cities with similar population size and density, European cities generally have a much greater application of rail transit. Despite extensive research into new technologies, no new mode has emerged with performance and cost characteristics superior or comparable to rail technology. Thus, to achieve more efficient and economical transit systems, information about rail modes must be increased and these modes must be included among the alternatives considered in transit planning.

Vuchic, VR Day, FB (Pennsylvania University, Philadelphia);  
Stanger, RM (Metropolitan Atlanta Rapid Transit Authority) *Transportation Research Record* No. 552, 1975, pp 1-18, 8 Fig., 2 Tab., 23 Ref.

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23 130415

**ECONOMIC RELATIONSHIPS AMONG URBAN TRANSIT MODES**

Economic relationships among demand-actuated, scheduled-route, and rapid transit services are examined to determine where the operating economy justifies intensive capital investment in permanent facilities. Analysis of national experience in the more heavily populated urban areas discloses that per capita ridership is much greater in areas served by rapid transit than in areas served only by street transit service, which in turn generates far higher levels of per capita ridership than demand-actuated service. The relationships cover common situations. Unique situations (e.g., New York's unusual costs and densities and San Francisco's experimental technology) are not included. Public acceptance is measured by comparing paid ridership with population and by reference to census data on the percentage of work trips made by transit. A general similarity between the two sources is evident, but rapid transit ridership outside New York is understated because of policies involving free transfers from buses and streetcars to rail transit. This does not impair city totals, however, in which transfers are not counted as additional trips. Costs are measured by financial records based on the number of vehicles operated. The usual denominator of vehicle miles (kilometers) varies based on speed or slowness, and hourly values vastly understate the cost of service provided only during peak hours when employees must be guaranteed pay for 40 hours/week. The results are empirical but appear to be realistic.

Tennyson, EL (Pennsylvania Department of Transportation) *Transportation Research Record* No. 552, 1975, pp 19-30, 2 Fig., 5 Tab., 10 Ref.

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23 142184

**PRICING AND SUBSIDY OF AIR AND RAIL PASSENGER TRANSPORT**

The background is presented and structure is analyzed of the pricing and subsidization practices of air and rail passenger transportation in Canada. Comment is made on the role of prices in a competitive economy, and on the economic rationale for user charges. The major conceptual, analytical, interpretive and statistical problems in transport cost analysis are briefly examined. The circumstance under which transport subsidies in general and passenger transport subsidies in particular may be justified on the grounds of both efficiency and effectiveness are discussed. The fare structure in rail and air passenger transport and the related trends and patterns are examined. Railway passenger deficits, subsidies and some of the related costing considerations are reviewed, and attempts to forecast subsidies in the near future are discussed.

Johnston, EE Ray, A Bunting, PM Mozersky, KA  
Canadian Transport Commission No. 246, Mar. 1976, 122 pp, Figs.,  
Tabs., Apps.

ORDER FROM: Canadian Transport Commission, Systems Analysis Branch,  
275 Slater Street, Ottawa, Ontario K1A 0N9, Canada

23 143927

**LIGHT RAIL TRANSIT: STATE OF THE ART REVIEW**

Operational experience in cities of Western Europe and North America suggests that light rail is a viable transit alternative for U.S. cities as well. This state-of-the-art review seeks to establish a common level of understanding of light rail transit among planners, community leaders and decision

makers. Contemporary planning concepts of light rail are reviewed and a description is provided of guideways, stations, hardware, operations and costs. The report examines the developmental trends of the last two decades which caused the revival of light rail in some western countries. The review focuses on the range of transit services offered by light rail, the utilization of a range of right-of-way opportunities along its routes, the lower investments and the potential for staged deployment associated with this mode.

Diamant, ES  
De Leuw, Cather and Company, Urban Mass Transportation Administration  
Final Rpt. UMTA-IT-06-0103-76-1, 1976, 312 pp

Contract DOT-UT-50009

ACKNOWLEDGMENT: NTIS  
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PB-256821/0ST, DOTL NTIS

**23 143931**  
**ANALYSIS OF WEST COAST CORRIDOR STUDY**  
**ALTERNATIVES**

The report investigates the social advisability, technical feasibility and economic practicality of high-speed ground transportation within the West Coast Corridor defined as the area between Tijuana, Mexico, and Vancouver, British Columbia through the cities of San Diego, Los Angeles, Fresno, San Francisco, Sacramento, California; Portland, Oregon; and Seattle, Washington. Four study scenarios were analyzed, including the null alternative, the high-speed ground transportation alternative (high-speed--100-mph and high-speed advanced systems--300 mph), the full-corridor study, and the subcorridor alternatives.

Prepared in cooperation with Parsons, Brinckerhoff, Quade and Douglas, Inc., San Francisco, Calif.

Peat, Marwick, Mitchell and Company, Federal Railroad Administration, Parsons, Brinckerhoff, Quade and Douglas, Inc. Final Rpt. FRA/RFA-1-76-01, Feb. 1976, 230 pp

Contract DOT-FR-6-38083

ACKNOWLEDGMENT: NTIS  
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PB-257178/4ST, DOTL NTIS

**23 144055**  
**INTERCITY PASSENGER TRANSPORT IN CANADA. A REVIEW**  
**OF THE EXISTING SYSTEMS**

The intercity passenger transport modes, the transportation companies, the economics of transport operations (bus, rail and air), intermodal costs and fares, government expenditures, marketing practices, level of service, and passenger movements are considered, and problems and deficiencies are identified and reviewed in an effort to assist in the development of alternative passenger transport systems. It was found that the automobile was the cheapest mode at current fuel price levels in the short travel haul and medium-haul trip market. Bus operations were profitable and characterized by low unit costs. Passengers in the long-distance trip market were price-sensitive, and services in the Maritimes were characterized by low speeds and few through services. The service of the 2 major rail operators all operate at a loss and require a subsidy. Rail fares tend to be higher than bus fares. The greater economic regulation of the air mode by the Federal government is noted, as well as the air mode's leadership with respect to marketing practices.

Canadian Transport Commission Res. Rpt. No. 252, Dec. 1975, 155 pp, Figs., Tabs., 4 App.

ORDER FROM: Canadian Transport Commission, Research Branch, 275 Slater Street, Ottawa, Ontario K1A 0N9, Canada

**23 146504**  
**PRELIMINARY STUDY FOR DEVELOPMENT OF A MACRO**  
**URBAN TRAVEL DEMAND MODEL**

The U.S. Department of Transportation spends billions of dollars annually in aid for the construction, maintenance, and operation of transportation systems throughout the country. In order to assist resource allocation decision making the Department is developing procedures to study the

effects of alternative transportation policies and programs. The TRANS model system is one component of this effort and is designed to forecast these effects in urbanized areas. However, there is dissatisfaction with some aspects of the demand predictions of the TRANS model. The primary purpose of the current study is to develop an aggregate travel demand model for urbanized areas to be used on an interim basis in conjunction with the TRANS model system until theoretical and empirical research can be undertaken to validate or modify the model proposed in this study.

Koppelman, FS  
Massachusetts Institute of Technology, Department of Transportation  
DOT-P-5010.1, Dec. 1972, 139 pp

Contract DOT-OS-10058

ACKNOWLEDGMENT: NTIS  
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PB-259961/1ST, DOTL NTIS

**23 146511**  
**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM**

No Abstract.

Set includes PB-259984 thru PB-259986.

Dynatrend, Incorporated, Federal Railroad Administration 3 Vols., Dec. 1975, 492 pp

ACKNOWLEDGMENT: NTIS  
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PB-259983-SET/ST, DOTL NTIS

**23 147310**  
**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK**  
**12.5-CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:**  
**BALTIMORE STATION**

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, MA 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. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 3 report dated 31 Mar 76, PB-259 986. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.5, Nov. 1976, 81 pp

Contract DOT-FR-56014

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**23 147311**  
**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK**  
**12.6-CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:**  
**WILMINGTON STATION**

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, MA 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. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identi-

files preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.5 report dated Nov 76, PB-260 802.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.6, Nov. 1976, 81 pp

Contract DOT-FR-56014

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### 23 147312

#### NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK 12.11- CORRIDOR STATIONS SCHEMATIC DEVELOPMENT: NEWARK STATION

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, MA 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. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.5 report dated Nov 76, PB-260 803.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.11, Nov. 1976, 84 pp

Contract DOT-FR-56014

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### 23 147314

#### DESIGN CRITERIA FOR ELEVATED TRANSPORTATION STRUCTURES AND MODAL EXCHANGE FACILITIES

Investigations and evaluations of existing elevated transportation systems were made to establish new guidelines and design standards for elevated transportation structures and modal exchange facilities. These criteria may be used to improve the physical condition of existing elevated systems and reduce their negative environmental impact on wayside areas. Prototypical renovations of existing transit structures and station areas are presented showing ways in which the new design standards may be applied to improve existing transit systems. Also, a prototypical elevated structure and a prototypical modal exchange facility are presented to demonstrate an application of the design criteria to hypothetical situations.

Gelick, MS Orseske, RJ Silver, ML  
Illinois University, Chicago, Department of Transportation Res. Rpt.  
DOT/TST-76/46, Jan. 1976, 123 pp

Contract DOT-OS-30092

ACKNOWLEDGMENT: NTIS  
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PB-260875/0ST, DOTL NTIS

### 23 147316

#### TRANSPORTATION AND TRAVEL IMPACTS OF BART: INTERIM SERVICE FINDINGS. BART IMPACT PROGRAM. PHASE I

The 71-mile Bay Area Rapid Transit (BART) System, serving San Francisco, Oakland, Berkeley and their suburbs, is the first regional-scale rapid transit system to open in the United States in 50 years. The final link of the system opened for service in September 1974. This report summarizes BART's initial impacts on regional transportation system performance and travel patterns. The report deals with the effects of interim BART service over the period September 1972 through June 1975. Impacts are assessed in

terms of BART's design and operating characteristics; its service levels; changes in accessibility; the level and nature of BART's ridership; impacts on travel by bus and automobile; impacts on the service provided by the rest of the transit system; and impacts on traffic congestion. BART's capital costs, interim operating costs and revenues, and interim energy consumption are also analyzed. (Color illustrations reproduced in black and white.)

Ellis, R Sherrett, A

Peat, Marwick, Mitchell and Company, Urban Mass Transportation Administration, Metropolitan Transportation Commission, (UMTA-CA-09-0025) Final Rpt. DOT-BIP-FR-6-3-75, Apr. 1976, 216 pp

Contract DOT-OS-30176

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### 23 147388

#### NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK 12.7. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT: PHILADELPHIA 30TH STREET STATION

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, MA and Washington, DC, including appropriate intermediate stops. As a basis for establishing a recommended development program to significantly improve intercity rail passenger service facilities at selected stations along the Northeast Corridor, the work of Task 12 consisted of the review of earlier work, the development of performance standards, and at each station, the evaluation of existing structural, mechanical and electrical conditions, development of alternative site and station concept plans, coordination with local agencies and Amtrak, selection of a recommended alternative, and preparation of schematic plans, outline specifications, implementation schedules and cost estimates. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program. (Portions of this document are not fully legible.)

See also Task 12.6, PB-260 803. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.7, Nov. 1976, 77 pp

Contract DOT-FR-56014

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### 23 147389

#### NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK 12.4. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT: NEW CARROLLTON STATION

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, MA and Washington, DC, including appropriate intermediate stops. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program. (Portions of this document are not fully legible.)

See also Task 12.2, PB-257 750. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.4, Nov. 1976, 53 pp

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23 147390

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK 12.12. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT: PENNSYLVANIA STATION, NEW YORK CITY**

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, MA and Washington, DC, including appropriate intermediate stops. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program. (Portions of this document are not fully legible.)

See also Task 12.11, PB-260 804. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration Final Rpt. FRA/NECPO-76/12.12, Nov. 1976, 86 pp

Contract DOT-FR-56014

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23 148587

**PERFORMANCE MODEL OF INTERCITY GROUND PASSENGER TRANSPORTATION SYSTEMS**

A preliminary examination of the problems associated with mixed-traffic operational-conventional freight and high speed passenger trains-is presented. Approaches based upon a modest upgrading of existing signal systems are described. Potential costs to the operating railroads, impact on railroad efficiency, and safety of passengers and train crews are considered. Special attention is given to analysis of stopping distance for various conditions and rolling stock. Basic conclusions are that speeds above 125 mph are likely to require substantial signal system modification and that freight service capacity will be severely degraded by large numbers of HSPT's; further analysis is required to determine well-founded control-system guidelines.

Research was sponsored by the Federal Railroad Administration, DOT.

Shladover, SE  
Transportation Systems Center, (DOT-TSC-FRA-75-13) Final Rpt. FRA-OR&D-76-08, Aug. 1975, 134 pp

ACKNOWLEDGMENT: FRA  
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23 148591

**PERFORMANCE ANALYSES OF INTERCITY GROUND PASSENGER TRANSPORTATION SYSTEMS**

This report documents the development of analytical techniques and their use for investigating the performance of intercity ground passenger transportation systems. The purpose of the study is twofold: (1) to provide a capability of evaluating new passenger train systems and (2) to provide information that assists in the formulation of development policies for new systems, thus, investigations evaluate the physical performance (average velocity, system capacity, mode split) of train systems with various design characteristics operating in a range of application conditions. Based on these analyses, conclusions are made regarding the potential performance effectiveness of train systems. The analyses cover design cruise speed, acceleration and braking rates, train length, seat density and lateral acceleration limits. Application characteristics considered include station spacing, dwell time, curve length, spacing and speed, switch concepts and train control strategies.

The Federal Railroad Administration, DOT, sponsored this research.

Hitz, JS  
Transportation Systems Center, (DOT-TSC-FRA-75-25) Final Rpt. FRA-OR&D-76-248, Apr. 1976, 192 pp

ACKNOWLEDGMENT: FRA, NTIS  
ORDER FROM: NTIS

PB-262925/1ST, DOTL NTIS

23 148611

**THE VALUE OF COMMUTER TRAVEL TIME SAVINGS**

The author attempts to define the value attached to savings in travel time by travellers at the marginal moment when this savings compels them to change their usual mode of transport. From statistical data collected in Sydney in 1971, he prepares tables giving the hourly values of the time saved, calculated by means of a mathematical model for several trip lengths, amounts of time saved and annual incomes. He recognises that this value decreases with the time saved and the trip length; he introduces a notion of thresh-hold, under which the amount of time saved is not felt and discusses these results.

Hensher, DE *Journal of Transport Economics and Policy* May 1976, pp 167-176, 2 Tab., 15 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: London School of Economics and Political Science, Houghton Street, Aldwych, London WC2A 2AE, England

DOTL JC

23 148811

**REPORT TO THE CONGRESS ON THE RAIL PASSENGER SERVICE ACT**

This report addresses the Dept. of Transportation's views and recommendations concerning Amtrak in the areas of policy and legislation, financial plans and rail operations.

This document is entitled on its cover: Rail passenger service act-report to Congress.

Department of Transportation Cong. Rpt. TD 1.10/5:974, No Date

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO (76-9686)  
ORDER FROM: DOT

DOTL HE2704.D47a

23 149008

**TYNE AND WEAR METRO-A MODERN RAPID TRANSIT SYSTEM**

The paper outlines the processes which gave rise to the rapid transit proposals for Tyneside, and the development of these into the Tyne and Wear metro. The concept of a fully integrated public transport system, capable of making a significant contribution to local movement and land use is explained, and the feasibility of introducing metro over a significant part of the existing British rail network detailed. A technical description of the metro includes civil engineering, signalling and communications, and electrification. The rolling stock is described in detail. The paper concludes with sections on finance and organization. /Author/ /TRRL/

Howard, DF *Institution of Mechanical Engineers Proceedings Analytic* Vol. 190 No. 18, 1976, pp 121-136, 4 Fig., 10 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 233662)  
ORDER FROM: ESL

DOTL JC

23 149059

**FARE POLICIES FOR MASS TRANSIT DEFICIT CONTROL: ANALYSIS BY OPTIMIZATION**

This paper reports on the analysis of a substantive problem in public policy planning. A dynamic model of demand, supply, cost and revenue relationships in the market for mass transit services in New York City is developed. This behavioral model is then placed in a deterministic optimal control framework to solve for the dynamic sequence of transit fares which optimize several plausible policy objective functions. Among the objective functions used are minimization of operating deficits and fare minimization subject to deficit constraints. The importance of multi-year planning for mass transit pricing policy is clearly established. We also present one way of describing efficient sequences of transit fares in the presence of ignorance of the policy-makers' ultimate objective function. Although the empirical results pertain to New York the analytical techniques seem to have general applicability to other mass transit systems. /Author/ /TRRL/



Garbade, KD (New York University, New York); Soss, NM *Transportation Research Analytic* Vol. 10 No. 4, Aug. 1976, pp 237-247, 6 Tab., 15 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 223669)  
ORDER FROM: ESL

DOTL JC

23 149377

#### JOINT USE OF RAILWAY FACILITIES BY FREIGHT AND METROPOLITAN TRANSIT SERVICES

The use of existing railway trackage by prospective metropolitan rail transit services involves a much lower construction cost than required when the public transportation services are to be operated on new trackage, even when the new rail transit trackage occupies the right-of-way on which the existing trackage is situated. Several operational problems associated with joint usage of existing railway trackage on the San Francisco Peninsula by both freight and public transportation services are identified. The procedures that are suggested for their resolution could be applied in other metropolitan areas as well.

Bergmann, DR *ASCE Journal of Transportation Engineering* Vol. 103 No. TE1, Proc. Paper 12686, Jan. 1977, pp 157-171

ACKNOWLEDGMENT: ASCE  
ORDER FROM: ESL

DOTL JC

23 149393

#### ACCESSIBILITY TO A RAIL NETWORK FOR SHORT AND MEDIUM DISTANCE TRAVEL: RESULTS AND EXPERIENCES IN THE TURIN BUILT-UP AREA

The article demonstrates a method of calculation for assessing, under certain conditions, improved accessibility to a rail network, following a series of technical measures to improve the level of service of the network in question. Accessibility, in this case, is regarded as a form of seeking the maximum distance from the access station, with effect from which the passenger wishing to reach a certain destination point will no longer find it an advantage to utilize the railroad.

Del Viscovo, M (Rome University, Italy); Sciarrone, G *Rail International* Vol. 7 No. 8, Aug. 1976, pp 431-442, 11 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

23 149428

#### HEARINGS ON TRANSCONTINENTAL PASSENGER TRAINS. SUMMARY OF FINDINGS

A summary of the views expressed by participants (politicians, trade unionists, businessmen, industrialists, groups) at the hearings organised at the Canadian Government's request in 14 towns, from 6 April to 14 July 1976.

Canadian Transport Commission Sept. 1976, 66 pp, 2 App.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Canadian Transport Commission, Systems Analysis Branch, 275 Slater Street, Ottawa, Ontario K1A 0N9, Canada

23 149437

#### THE SITUATION WITH AIR TRANSPORT. ITS POSITION AND RELATIONS WITH REGARD TO SURFACE TRANSPORT

Brief summary of air transport developments over the last fifteen years; according to the author air transport is getting its second wind. With regard to the technical and commercial renovation of surface transport, he analyses the situation under three aspects: competition, complementarity and coordination.

Mercier, J *Rail International* Vol. 7 No. 12, Dec. 1976, pp 673-677

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

DOTL JC

23 149699

#### MOBILITY EVALUATION FOR URBAN PUBLIC TRANSPORTATION

The paper discusses the concept of mobility relative to the provision of transportation services. Mobility calculations of potential value to current evaluation procedures are outlined. An example is given of a typical mobility calculation. The model has been focused on a corridor line-haul system and results suggest that such a system will not markedly improve existing transit mobility systems. The authors suggest that other methods should be explored before policies are finalised. The study includes a match factor between occupation and employment type in accessibility to employment. Alternative feeder transit systems to the corridor line with an improved collector service in the suburbs could increase mobility. /TRRL/

Popper, RJ (Virginia Polytechnic Institute & State University); Hoel, LA (Virginia University) *Transportation Planning and Technology Analytic* Vol. 3 No. 3, Sept. 1976, pp 131-141, 5 Fig., 39 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-223939)  
ORDER FROM: ESL

23 149941

#### SPECTRA, A PUBLIC TRANSPORT SYSTEM FOR TOWNS AND REGIONAL AREAS (PART 1) [Spectra, openbaar vervoersysteem voor stad en streek]

Because of the discrepancy between the admitted value of public transport of good quality and the degree to which modern public transport can in fact meet today's expectation patterns the Dutch firms Daf-Holding and Ogem, together with the Netherlands railways, developed a new concept for transport in towns and regional areas called Spectra. The system is based on a considerable acceleration of trunk services by means of trams or (trolley)-buses with an average speed of 30 km/h, and halting every 800-1000 metres. Radiating from these stops of special design, small vehicles run frequently into the very heart of the residential areas, permitting a maximum interchange time of only two minutes at the connecting points of the two systems. /TRRL/ [Dutch]

Van, HLH *Verkeerskunde* Vol. 27 No. 11, Nov. 1976, pp 544-549, 7 Fig., 1 Phot.

ACKNOWLEDGMENT: Institute for Road Safety Research (SWOV60002E), TRRL (IRRD 224112)

ORDER FROM: Dutch Touring Club ANWB, Wassenaarseweg 220, Box 2200, The Hague, Netherlands

23 149943

#### MODERN EXPRESS TRAMS [Moderne Sneltrams]

This book starts from the how and why of the renewed interest in modern tramway technology or light rapid transit (LRT). An attempt has been made to build up a current picture of the state of the art, in which the most relevant features of LRT as a public transport system are highlighted, including the reasons for its rebirth, traffic management developments, town planning, environmental and system building considerations. A closing chapter assembles the most important criteria for financial, socio-economic, commercial and political evaluation, which are, wherever possible, quantified. /TRRL/ [Dutch]

Kaper, HP

Uitgevers Wijt, (90-6007-558-7) Monograph 1976, 156 pp, Figs., Photos.

ACKNOWLEDGMENT: Institute for Road Safety Research (SWOV60008E), TRRL (IRRD 224118)

ORDER FROM: Uitgevers Wijt, 111 P de Hoochweg, Rotterdam, Netherlands

23 149968

#### PASSENGER TARIFF SYSTEM IN LONG DISTANCE TRAFFIC [O sisteme passazirskih tarifov v dal'nem soobschenii]

This article examines the results of cost price calculations (direct production costs) and of basic production costs (invested capital) in order to compare them with existing tariffs, and makes recommendations for the future development of the tariff system. [Russian]

Belen'kij, MN *Zheleznodorozhnyi Transport* No. 10, 1976, pp 79-83

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 4, Moscow B-174, USSR

23 151143

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM TASK  
12.9. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
TRENTON STATION**

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, MA and Washington, DC, including appropriate intermediate stops. The report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.6, PB-260 803. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
FRA/NECPO-76/12.9, Dec. 1976, 159 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262380/9ST, DOTL NTIS

23 151144

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM TASK  
12.15. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
NEW HAVEN STATION**

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, MA and Washington, DC, including appropriate intermediate stops. The report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.12, PB-261 441. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
FRA/NECPO-76/12.15, Dec. 1976, 91 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
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PB-262381/7ST, DOTL NTIS

23 151165

**ESTIMATION OF THE OPERATING COST OF MASS TRANSIT  
SYSTEMS**

A new model has been presented for estimating the operating cost of a proposed mass transit system in an intermediate to long-range planning environment. The document is the final report on the development and implementation of scheduling, estimation and costing procedures for transportation planning. The project was sponsored by the Urban Mass Transportation Administration (UMTA) and has been closely related to the Urban Transportation Planning System (UTPS), a computer system developed by the Planning Methodology and Technical Support Division of UMTA to assist transportation planners in the analysis and costing of proposed transportation systems. The work presented was the outgrowth of the building of a cost model for UTPS based on actual vehicle schedules and accurate estimates of manpower requirements. This work includes a new cost model, procedures to form line schedules from UTPS input, vehicle schedules, and manpower estimates, and the development of computer program UCOST which is implemented within UTPS. The major goal of the work is the development of a cost model appropriate for long-range planning.

Bodin, LD Rosenfield, D

State University of New York, Stony Brook, Urban Mass Transportation Administration, (UMTA-NY-11-0012) Final Rpt. WAHCUPS-UMTA-1-76, UMTA-NY-11-0012-77-1, Sept. 1976, 155 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262729/7ST, DOTL NTIS

23 151208

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM TASK  
12.16. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
NEW LONDON STATION**

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, MA and Washington, DC, including appropriate intermediate stops. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.15, PB-262 381. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.16, Dec. 1976, 62 pp

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ACKNOWLEDGMENT: NTIS  
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PB-263106/7ST, DOTL NTIS

23 151209

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM TASK  
12.18. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
ROUTE 128 STATION**

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, MA and Washington, DC, including appropriate intermediate stops. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.18, Dec. 1976, 73 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
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PB-263107/5ST, DOTL NTIS

23 151210

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM TASK  
12.19. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
BOSTON SOUTH STATION**

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, MA and Washington, DC, including appropriate intermediate stops. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.19, Dec. 1976, 75 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
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PB-263108/3ST, DOTL NTIS

**23 151211**

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM TASK  
12.10. CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
METROPARK STATION**

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, MA and Washington, DC, including appropriate intermediate stops. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.9, PB-262 380. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.10, Dec. 1976, 57 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
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PB-263109/1ST, DOTL NTIS

**23 151249**

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK  
12.17- CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
PROVIDENCE UNION STATION**

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, MA 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. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.12, PB-261 441. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.17, Dec. 1976, 81 pp

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**23 151250**

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK  
12.8-CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
CORNWELLS HEIGHTS STATION**

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, MA 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. This report is one in a series which defines the scope of

work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.7, PB-261 439. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.8, Dec. 1976, 64 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
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PB-263792/4ST, DOTL NTIS

**23 151719**

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK  
12.3-CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
SUMMARY REPORT**

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, MA 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. This Report summarizes the development of schematic plans for all of the 16 station locations studied in Task 12. It provides Summary Tables of the Station Development, Patronage, Parking and Costs. It also includes the Synopsis and the primary drawings selected from the full sets of Schematic Drawings for each station.

See also Task 2, PB-259 985. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.3, Dec. 1976, 352 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
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PB-263790/8ST, DOTL NTIS

**23 151720**

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK  
12.13- CORRIDOR STATIONS SCHEMATIC DEVELOPMENT:  
RYE STATION**

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, MA 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. This report is one in a series which defines the scope of work to be undertaken at each station on behalf of the high speed rail system; delineates the physical planning configurations for the station building, vehicular access/egress system, parking, and platform facilities; and identifies preliminary estimates of construction costs to implement the recommended development program.

See also Task 12.12, PB-261 441. Microfiche copies only.

Weese (Harry) and Associates Limited, Federal Railroad Administration  
Final Rpt. FRA/NECPO-76/12.13, Dec. 1976, 64 pp

Contract DOT-FR-56014

ACKNOWLEDGMENT: NTIS  
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PB-263791/6ST, DOTL NTIS

23 152450

**TIME SPENT ON JOURNEYS IN THE GERMAN FEDERAL REPUBLIC [Der Zeitbedarf fuer Reisen in der Bundesrepublik Deutschland]**

One of the most important factors influencing the choice of transport mode, is the time taken for the journey. To determine this time as exactly as possible, a record was kept of the different time elements in journeys by private car, by rail and by air, using speed measuring distances covered by car, by measuring time constants, by surveys among passengers, and by the study of existing documents and a geometrical analysis. [German]

Breimeier, R *Internationales Verkehrswesen* Vol. 28 No. 4, July 1976, pp 204-213, 8 Fig., 1 Tab., 37 Ref.

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

23 152454

**DYNAMIC STUDY OF THE RUNNING OF GERMAN FEDERAL RAILWAY SERIES 420 ELECTRIC TRAINSETS [Fahrdynamische Untersuchungen des elektrischen Triebwagens Baureihe 420 der Deutschen Bundesbahn]**

By using appropriate electronic computer programs, the author obtains specific figures for starting distance, starting duration, braking distance and loss of time over sections with a speed restriction, as functions of influence factor figures, and he plots graphs for a selection of the results. [German]

Westphal, J *Eisenbahntechnische Rundschau* Vol. 25 No. 9, Sept. 1976, pp 524-533, 13 Fig., 3 Tab., 6 Ref.

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

DOTL JC

23 152608

**HIGH SPEED TRAINS FOR CONVENTIONAL RAILWAY LINES**

High speed multiple-unit trains will be the perfect solution for passenger transportation in many countries. The conditions for this type of train are discussed and compared with other types of high speed transportation systems. Computers have made it possible to perform theoretical studies and simulations of the running of railway vehicles on a track with irregularities. Bogie design with different types of primary suspension and wheel profile are important parameters for good running characteristics and low maintenance costs. By tilting the car body it is possible to increase the speed through a curve approximately 40% with comfort preserved for the passengers. An accelerometer in the leading bogie is used to give a signal for required tilting angle. Passenger service with high-speed trains demands high power transmission through lightly-loaded axles to minimise track stresses.

Presented at the biennial International Conference of Hovercraft, Hydrofoils & Advanced Transit Systems, May 17-20, 1976, Amsterdam, Netherlands.

Nordin, T Hagsjo, S  
International Hydrofoil Society Conf Paper 1976

ACKNOWLEDGMENT: EI (EIX770300217)  
ORDER FROM: ESL

23 152615

**PROTOTYPE APTS TAKE SHAPE AT DERBY**

Important elements of British Rail's three prototype advanced passenger trains are now being tested and the first complete train will start trial running later this year. Commercial service at 200 km/h will begin in autumn 1978, when the 646 km between London and Glasgow will be covered in 4 hours. The prototypes differ in many respects from the experimental APT-E completed in 1972. Apart from the use of electric traction, both types of bogie have been extensively redesigned and the trailer car bodies are formed from wide aluminum extrusions.

*Railway Gazette International* Vol. 133 No. 1, Jan. 1977, 3 pp

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

23 152664

**THE DEMAND FOR INTERCITY RAIL TRAVEL: A COMPARISON OF THE BRITISH AND AMERICAN EXPERIENCES**

This study examined reasons British Railways maintained a dominant share of intercity passenger markets while U.S. railways experienced drastic declines, even in the Northeast Corridor with demographic, economic and geographic factors like those in Britain. Statistical analysis suggests that demands for intercity rail journeys in the U.S. Northeast Corridor and Great Britain respond to similar influences in approximately the same degree. When speed, cost, comfort and convenience of train travel in the Northeast Corridor attain the level already existing in Britain, this paradox may be resolved.

Sloss, J Kneafsey, JT (Massachusetts Institute of Technology) *Transportation Journal* Vol. 16 No. 3, Mar. 1977, pp 71-80, 4 Tab., 19 Ref.

ORDER FROM: ESL

DOTL JC

23 152684

**IOWA RAIL PASSENGER SERVICE STUDY**

This study examines passenger transport alternatives for east-west travel in and through the State of Iowa to guide decisions regarding the necessity, practicality and desirability of additional rail passenger service and was prepared at the request of the Iowa legislature. The present Amtrak route across southern Iowa was compared with populations, competitive services, travel times, frequency and flexibility, as well as per-passenger costs, of three other possible cross-state rail routes. It was concluded that predicted ridership of any new route would be small, that there would be not significant energy savings or environmental enhancement, necessary subsidy funds would yield greater public benefit if used in other ways, and there was little prospect of such service being operated as an Amtrak experimental route.

Iowa Department of Transportation Feb. 1976, 93 pp, 1 Fig., 13 Tab., 29 Ref., 23 App.

ORDER FROM: Iowa Department of Transportation, Office of Transportation Research, Planning and Research Div, Des Moines, Iowa, 50319

23 152785

**EVALUATION OF INTERMEDIATE CAPACITY TRANSIT SYSTEMS**

This paper is concerned with the evaluation of intermediate capacity transit system (ICTS). The overall objective is to examine those technologies suitable for application to cities of 1/2 to 1 million population, and to present a framework for the evaluation of the systems when applied to such cities. The framework proposed is comprehensive but simple, using a linear rating technique to compare each system against set standards and objectives, with a subjective assessment of qualitative factors. The technologies evaluated provide capacity in the 6,000 to 20,000 persons per hour per direction range, cost approximately 1/3 to 1/2 that of heavy rapid transit on a per-mile basis and include such systems as light rail transit, light guideway transit and bus transit. The application of the framework is illustrated with an evaluation of candidate transit technologies for the City of Calgary which is typical of North American cities of approximately 500,000 population.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September-October 2, 1975.

Morrall, J (Calgary University, Canada); Finn, N  
Institute of Electrical and Electronics Engineers, (75CH0999-31A) Conf Paper 1975, pp 247-256, 16 Ref.

ACKNOWLEDGMENT: EI (EIX770200041)  
ORDER FROM: ESL

23 152787

**CRIME AND PERCEPTION OF CRIME ON A METROPOLITAN MASS TRANSIT SYSTEM**

Crime on transit systems has become a serious problem. Besides the hardship placed on those who are victimized, crime also seems to be a cause of decreasing patronage. Expansion of present systems or construction of new ones will alleviate the energy-environmental crunch only if commuters can be recruited away from their use of private automobiles. A study of transit

crime coupled with a telephone survey reveal that transit crime is perceived differently from street crime. The results indicate that transit systems require uniquely designed security systems to reduce crime and increase public confidence in the system.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

Cooley, WL (West Virginia University); Bartel, EW Shellow, R Institute of Electrical and Electronics Engineers, (75CH0999-31A) Conf Paper 1975, pp 377-381

ACKNOWLEDGMENT: EI (EIX770200044)  
ORDER FROM: ESL

23 152788

**ELECTRONIC SURVEILLANCE/RESPONSE SYSTEM TO REDUCE CRIME ON A MASS TRANSIT FACILITY**

This paper covers Carnegie-Mellon University's design of a surveillance response system to reduce crime on the City of Chicago's transit system. It includes a brief review of the possible electronic devices applicable to a public transit system security network. The "Television Alert System", which has been accepted and is being installed in Chicago is described in detail.

Presented at the 10th IEEE Industry Applications Society Annual Meeting, Conference Record, Atlanta, Georgia, September 28-October 2, 1975.

Bartel, EW (Carnegie-Mellon University); Cooley, WL Shellow, R Institute of Electrical and Electronics Engineers, (75CH0999-31A) Conf Paper 1975, pp 382-388

ACKNOWLEDGMENT: EI (EIX770200045)  
ORDER FROM: ESL

23 152814

**ANALYSIS ON PARK-AND-RIDE AS A MODAL CHOICE**

Data obtained from a questionnaire survey on the so-called park-and-ride (P&R), i. e., a travel mode under which car users in suburban areas travel to a metropolitan area by car to a local railroad station, park the car there, and continue their ride by train, are analyzed. The analysis shows that the P&R can be classified into "access-type P&R" and "prime-type P&R". The access-type P&R is classified again into the "distant-type P&R" and "close-type P&R" according to access modes. The parking lots for the access-type P&R should be located at a certain distance from the station to give priority to the distant-type P&R and to save the capacity and cost.

Mori, M Watanabe, C Nakayama, H *Osaka University Technology Reports* Vol. 25 No. 1254, Oct. 1975, pp 459-471, 18 Ref.

ACKNOWLEDGMENT: EI (EIX770200154)  
ORDER FROM: ESL

23 153049

**LIGHT RAIL TRANSIT IN THE CANADIAN CONTEXT. INTRODUCTION AND OVERVIEW**

This paper is a brief introduction and overview of the factors and aspects of Light Rail Transit technology, its application considerations, a progress report on the LRT system being implemented as well as the conception of an LRT system incorporating technological advancements.

Proceedings of RTAC Annual Conference, Calgary, Alberta, 1975.

Eggleton, PL (Transportation Development Agency) Roads and Transportation Association of Canada Proceeding Sept. 1975, pp 133-136

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada, 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

23 153050

**COMMUTER RAIL PLANNING IN ONTARIO: AN OVERVIEW OF PLANNING AND OF OPERATIONAL AND RIDERSHIP CHARACTERISTICS**

The gap between travel demand and supply in the Toronto region is being widened with the result that peak period congestion on both existing transit and road facilities is becoming progressively worse. The extension and

expansion of existing or implementation of new commuter rail facilities are discussed in this report including legislative and institutional considerations, level of service, planning, stations and cost.

Proceedings of RTAC Annual Conference, Calgary, Alberta, 1975.

Kidman, LR Schwabl, L (Ontario Ministry of Transportation & Communic, Can) Roads and Transportation Association of Canada Proceeding No. 7, Sept. 1975, pp 43-80, 16 Fig., 5 Tab.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada, 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

23 153051

**CONCEPT DEFINITION OF AN INTERMEDIATE CAPACITY TRANSIT SYSTEM**

It is believed that the project of rail transit lines represents a significant federal initiative in the area of urban transportation research and development. The purpose of this paper is to describe in general terms the work which will be carried out, and the manner in which it will be administered.

Proceedings of RTAC Annual Conference, Calgary, Alberta, 1975.

Rudback, NE (Transportation Development Agency) Roads and Transportation Association of Canada Proceeding No. 7, Sept. 1975, pp 169-178

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada, 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

23 153053

**EDMONTON'S NORTHEAST LIGHT RAPID TRANSIT PROJECT: LRT IMPLEMENTATION PROGRESS IN THE CITY OF EDMONTON**

This paper discusses whether the intermediate-capacity transit line is economically viable and acceptable in the community-social sense. In terms of capacity, the studies underline a problem inherent in coping with large peak passenger-handling capacities by conventional full-scale bus services (in the order of "a bus per minute" flows)--that of high operating cost very susceptible to inflation.

Proceedings of the RTAC Annual Conference, Calgary, Alberta, 1975.

MacDonald, DR (City of Edmonton, Alberta, Canada) Roads and Transportation Association of Canada Proceeding No. 7, Sept. 1975, pp 161-167, 1 Fig.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada  
ORDER FROM: Roads and Transportation Association of Canada, 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

23 153393

**AERODYNAMICS AS A SUBWAY DESIGN PARAMETER**

A parametric sensitivity study has been performed on the system operational energy requirement in order to guide subway design strategy. Aerodynamics can play a dominant or trivial role, depending upon the system characteristics. Optimization of the aerodynamic parameters may not minimize the total operational energy. Isolation of the station box from the tunnel and reduction of the inertial power requirements pay the largest dividends in terms of the operational energy requirement.

Kurtz, DW *High Speed Ground Transportation Journal* Vol. 10 No. 3, Sept. 1976, pp 247-254

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

23 153793

**THE "SERIES 5000" ROLLING STOCK FOR THE MADRID METRO [Le materiel roulant series 5000 du Metro de Madrid]**

To cope with increasing passenger traffic in a satisfactory manner, the MADRID Metro has recently purchased 65 two-car trainsets giving higher capacity, improved comfort, greater reliability and lower maintenance costs. These steel-constructed two-car trainsets weigh 64 t. They operate on a 600 V d.c. supply, can reach 90 km/h and are powered by four 210 kW

monomotor bogies. The soundproofing and temperature control installations in the coaches are particularly well designed. The door-operating equipment is pneumatic. The underframes are of welded steel plate construction and the motors are fully suspended. Electric-pneumatic brakes are fitted. These trains have automatic driving and state of line display equipment. [French]

Tejero, R *Revue Generale des Chemins de Fer* Feb. 1977, pp 97-102, 8 Fig., 1 Tab.

ACKNOWLEDGMENT: *Revue Generale des Chemins de Fer*  
ORDER FROM: ESL

DOTL JC

**23 153795**  
**OPTIMUM STATION SPACING ON A RAILWAY LINE**  
[Interstation optimale sur une ligne de chemin de fer]

The author makes a theoretical study of a model for building a railway line or a metropolitan railway in a given area taking the minimisation of the passenger's journey time as the optimisation criterion. Such a model enables the repercussion of the various solutions considered to be tested in relation to the cost of infrastructure, rolling stock and operations. [French]

Mehrazine, H (Teheran University, Iran) *Revue Generale des Chemins de Fer* Feb. 1977, pp 107-110, 3 Tab.

ACKNOWLEDGMENT: *Revue Generale des Chemins de Fer*  
ORDER FROM: ESL

DOTL JC

**23 154045**  
**EVALUATION OF RAIL RAPID TRANSIT AND EXPRESS BUS SERVICE IN THE URBAN COMMUTER MARKET**

The study analyzes and evaluates public transportation alternatives for serving the commuter market. The two main alternatives, rail rapid transit and integrated express bus service, are analyzed from the standpoint of full costs (both supplier and user time costs). User time costs of the two alternatives are roughly equal; however, the supplier costs of the integrated bus service are much lower than those of rail rapid transit. Quantitative data on fuel consumption and emissions are presented, and the effects of political, regulatory, and institutional constraints are discussed.

Boyd, JH Asher, NJ Wetzler, ES  
Institute for Defense Analyses, Office of Policy, Plans and International Affairs Final Rpt. DOT/TPI/10-77/11, Oct. 1973, 267 pp

Contract DOT-OS-20019

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265236/0ST, DOTL NTIS

**23 154772**  
**ECONOMIC CHARACTERISTICS OF THE URBAN PUBLIC TRANSPORTATION INDUSTRY**

In addition to presenting an overview of the economic conditions in the urban public transit industry as a whole, this project incorporated four papers that investigated separately the economic characteristics of the urban bus, rail rapid, commuter rail, and taxicab industries. Also included were three papers in which an econometric model of urban bus transit was developed, regulatory constraints and their implications were reviewed, and external effects of urban transit operations such as air and noise pollution and accident were analyzed. The analyses tended to be rather general, concluding that demand deficiency, especially for bus transit, was the main cause of the economic difficulties of urban transit systems.

Wells, J Asher, NJ Flowers, MR Kamrass, ME Nelson, GR  
Institute for Defense Analyses, Office of Policy, Plans and International Affairs Final Rpt. DOT/TPI/10-77/09, Feb. 1972, 440 pp

Contract DOT-OS-10017

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265325/1ST, DOTL NTIS

**23 155345**  
**PROCEEDINGS OF THE URBAN MASS TRANSPORTATION ADMINISTRATION/AMERICAN PUBLIC TRANSIT ASSOCIATION RESEARCH AND DEVELOPMENT PRIORITIES CONFERENCE (2ND) HELD AT ARLINGTON, VIRGINIA ON NOVEMBER 30-DECEMBER 1, 1976**

The report contains the papers, a summary, and recommendations for each of five workshop sessions held during the conference. The material specifically addresses the following aspects of urban transportation research and development: viewpoints on UMTA's R&D priorities from spokesmen for transit operators, state governments, and local governments; needs and priorities in policy-related research and development and deployment; implementation of nonhardware innovations; technology delivery systems; and information exchange.

See also PB-255 898.

American Public Transit Association, Urban Mass Transportation Administration, (UMTA-DC-06-0157) Proceeding UMTA-DC-06-0157-77-1, Mar. 1977, 103 pp

Contract DOT-UT-70026

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-266158/5ST, DOTL NTIS

**23 156208**  
**IMPROVEMENT OF AN UNDERGROUND'S TRANSPORT CAPACITY WITH TWO DIFFERENT OBJECTIVES**

The paper deals with optimization studies that looked into minimizing run time as train frequency increases, (this minimizes the number of trains necessary to run the service); and making the best use of the given theoretical transport capacity by looking for all servicing trains with balanced load. The studies were part of an investigation into connecting the Paris subway system with a suburban subway. They were carried out using new hierarchic simulation methods.

Proceedings of the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976.

Castel, C (CERT/DERA, Toulouse, France); Gaillet, A Cervoni, M Hennebert, M  
International Federation of Automatic Control Proceeding 1976, pp 277-282

ACKNOWLEDGMENT: EI (EIX770400439)  
ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

**23 156209**  
**TRAFFIC CONTROL POLICIES FOR AN UNDERGROUND SYSTEM**

On underground railway lines with low exploitation interval, when disturbances occur, the number of trains and stations involved increases rapidly in proportion to the size of the incident. The paper discusses a method for controlling the results of an incident by reabsorbing and distributing these disturbances in the entire traffic system. To do this, the regulation demands a new schedule for all trains and stations affected by the incident by acting upon the stop times and speeds controlled by the automatic train control.

Proceedings of the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976.

Mampey, R (CERT, Toulouse, France); Paulignan, JF  
International Federation of Automatic Control Proceeding 1976, pp 283-293

ACKNOWLEDGMENT: EI (EIX770400440)  
ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

**23 156245**  
**KEEPING A SEAT ON EUROPE'S NETWORK**

Information on the European organisation for train reservations, projects being studied or being carried out is presented. Freight traffic management will be operational in 1979 and passenger traffic in about 1982.

Berenyi, I *Data Systems* Apr. 1976, pp 15-18, 4 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Embankment Press Limited, Hutton House, London EC4  
Y8AQ, England

DOTL JC

23 156248

**THE REGIONAL STRUCTURE OF TRANSPORT IN THE GERMAN FEDERAL REPUBLIC IN 1970 AND 1990. PASSENGER TRAFFIC DEMAND [Die regionale Struktur des Verkehrs in der Bundesrepublik Deutschland in den Jahren 1970 und 1990 Personenverkehrsnachfrage]**

No Abstract. [German]

Voigt, U *DIW-Wochenbericht* Vol. 43 No. 42, 1976, pp 381-385, 2 Tab., 1 Phot., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Deutsches Institut fuer Wirtschaftsforschung, Konigin-Luise-Strasse 5, 1000 Berlin 33, West Germany

23 156253

**N.J. RAILROADS PASSENGER SURVEY. 1974**

In the Spring of 1974, the Port Authority, with the cooperation of the New Jersey Department of Transportation, the Tri-State Regional Planning Commission and the New Jersey commuter railroads sponsored a comprehensive survey of the New Jersey railroad passengers. This survey covered more than 100,000 rail patrons who were making eastbound trips on a typical weekday. It obtained data describing the patrons' entire trips, not just the rail portion. Information such as mode, distance and time of access to rail stations, parking at stations, mode of distribution at terminals, trip purpose, occupation and income, employment, residence mobility and much more was gathered in addition to the traditional data obtained in an origin and destination survey. This report summarizes the results of this survey for all passengers boarding Penn Central, Central Railroad of New Jersey, Reading, North Jersey Coast Line or Erie-Lackawanna commuter trains. In many cases, data is presented by individual railroad thus showing differences between patrons, facilities and conditions specific for each railroad.

Port Authority of New York and New Jersey Survey No Date, 76 pp, 3 Fig., Tabs., 1 App.

ACKNOWLEDGMENT: Port Authority of New York and New Jersey  
ORDER FROM: Port Authority of New York and New Jersey, Planning and Development Department, One World Trade Center, New York, New York, 10048

DOTL RP

23 156317

**ANALYSIS OF TRANSIT OPERATIONS: FARE/FREQUENCY TRADEOFFS**

The paper discusses modeling of transit operations on a route-by-route basis. In particular, explicit relationships between ridership, revenue, fare and frequency are sought. Functional forms for two models--demand and cost--are assumed. The forms--constant elasticity demand and linear cost--are simple enough to allow analytical solutions yet sufficiently rich to portray most of the essential tradeoffs. The models are not system aggregate but are intended to model a given route at a given time of day. The implications of these assumptions are shown on the "frequency-fare" plane. This plane is shown to be divided into two areas, one of excess capacity and one of excess demand.

Presented at the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976.

Lion, PM (Princeton University); Obermann, RM  
International Federation of Automatic Control Proceeding 1976, pp 73-80

ACKNOWLEDGMENT: EI (EIX770400450)

ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

23 156472

**MOVING IN CITIES**

In this book, the author proposes practical solutions to the problems of urban mobility, and in doing so, draws on a whole range of new public transport systems resulting from modern technology. The book also explores

what is being done to enable existing transport modes to work more efficiently, and how simple pleasures such as walking in cities and cycling are being made more enjoyable. Topics covered include the following: strategies for public transport; movement in the city centre; pedestrian movement systems (walking, conventional mechanical systems, conveyors, vehicular); passenger interchanges including park and ride, kiss and ride; goods movement (pneumatic pipelines for materials transport, canals, etc.); transport in residential areas; recreational trips (accessibility to the countryside, swimming pools, sports facilities etc.); moving pavements; continuous systems; rail and guideway systems (rapid transit tramways, automatic guidance systems, group-rapid transit, personal rapid transit); bus transport (operation, control, fares, design, infrastructure, dual-mode operation); dial-a-ride; car hire; cycling and cycleways. /TRRL/

Richards, B

Casell & Collier Macmillan Publishers Limited Monograph 1976, 104 pp, Figs., 1 Tab., Photos., 25 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 225439)

ORDER FROM: Macmillan Company, 866 Third Avenue, New York, New York, 10022

23 156890

**SPATIAL ORIENTATION IN A SUBWAY SYSTEM**

The absence of a clear structural legibility within the New York City subway system tends to make its users dependent on other informational aids about its structural design and operations--such as signs, announcements, and especially the official New York City subway map and guide. The effectiveness of the New York City subway guide was tested by assigning 20 subjects a travel route which consisted of four trip-segments of varying difficulty. Of the total 80 trip segments, only 37 were traveled via acceptable (as determined by authors) solutions, with subjects having more difficulty planning acceptable solutions for more complex trip-segments. Interviews revealed that subjects felt insecure traveling the subway because the graphics in the system did not serve to reinforce their train selections. The findings suggest that the New York City subway system needs an improved map to guide its passengers as well as better systemwide graphics. /Author/ /TRRL/

Bronzaft, AL (New York City University); Dobrow, SB (Fairleigh Dickinson University); O'Hanlon, TJ (New York City University)  
*Environment and Behaviour Analytic* Vol. 8 No. 4, Dec. 1976, pp 575-594, 4 Fig., 3 Tab., 12 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-225334)

ORDER FROM: Sage Publications Limited, St George's House, 44 Hatton Garden, London, England

23 157488

**A SURVEY AND REVIEW OF THE EXETER-BARNSTABLE RAILWAY SERVICE**

The report is based on a survey of the Exeter-Barnstable railway line and shows that feeder-line traffic to an inter-city network can be sufficient to justify its retention. It is shown that revenue generated over the inter-city network as a result of the existence of such feeder-lines is often in excess of the operating loss assigned to the minor route. The study illustrates the dangers of passenger revenue reduction resulting from short-term cost savings being enforced in the form of local rail service closures. Recommendations are made for improvement of rural public transport services by retiming bus services to provide connections with train services. Suggestions are also made concerning the management and planning of a possible coach replacement for the feeder-line should the railway link be closed. /TRRL/

Williams, SR Heels, P

Polytechnic of Central London Monog Rpt. Discussion Paper 3, Feb. 1976, 60 pp, 10 Fig., 6 Tab., 3 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-224812)

ORDER FROM: Polytechnic of Central London, 35 Marylebone Road, London, England

23 157532

**INTERCITY PASSENGER TRANSPORT IN EUROPE AND NORTH AMERICA [Les transports interurbains de voyageurs en Europe et en Amerique du Nord]**

Intercity passenger transport in North America is based on the use of the most expensive techniques (aircraft and automobile) while in Europe the



Railway has to some extent retained its importance. The various modes of public transport are described as regards their organisation, their role and tariff system. The contrasts between operating conditions in the two continents are emphasized. The various differences between the transport systems are then reviewed. [French]

Wolkowitsch, M *Annales de Geographie* Sept. 1976, pp 579-596, 1 Fig., 8 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Librairie Armand Colin, 103 Boulevard St-Michel, Paris 5e, France

23 157558

**REGULAR DEPARTURES AT ONE-HOUR INTERVALS FOR GERMAN FIRST AND SECOND CLASS TRAINS. A PROPOSAL MADE BY A DB CUSTOMER [Deutschland im Einstunder-Takt mit 1. und 2. Wagenklasse. Vorschlag eines Kunden der Deutschen Bundesbahn]**

The author briefly describes the development of the DB's long-distance train timings to the present day and the fast train services offered by other Railways. He then explains the need for an intercity network with regular hourly train services and supports his arguments with suggested timetables, giving examples to show that such a system would allow for better connections with secondary lines than at present. [German]

Simon, R *Eisenbahntechnische Rundschau* Vol. 26 No. 1/2, Jan. 1977, pp 61-68, 5 Tab.

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

DOTL JC

23 157673

**TRANSIT STATION PLANNING AND DESIGN: STATE OF THE ART**

Among the recommendations given in the book are the establishment of a data clearinghouse on transit design and operation; the preparation and publication of a standardized design manual; flexibility and modularity in design procedures to allow for future expansion and changes; renovation of existing older transit stations; consumer-oriented research to establish the riders' preferences and needs; development of simulation models to prevent costly errors in full-scale construction; and greater emphasis on multidisciplinary decision making.

Carnegie-Mellon University No Date, 183 pp

ORDER FROM: Carnegie-Mellon University, Transportation Research Institute, Pittsburgh, Pennsylvania, 15213

23 157913

**HOW DOES THE DB OPERATE IN RESEARCH INTO THE PASSENGER TRAFFIC MARKET? [Wie operiert die DB bei der Erforschung der Personenverkehrsmaerkte?]**  
No Abstract. [German]

Heine, G Polten, J *Die Bundesbahn* Vol. 52 No. 11, Nov. 1976, pp 719-722

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

23 157933

**THE LAYOUT OF HIGH-SPEED RAIL PASSENGER TRUCK LINES, AS SEEN FROM THE COMMERCIAL STANDPOINT [Die kommerzielle Trassierung von Fernbahnen des Personenverkehrs fuer hohe Fahrgeschwindigkeiten]**

The study lists the results of a study commissioned by the DB in 1974 from the Transport Institute of the Hannover University of Technology, and explains the main findings basic to the commercial success of high-speed rail passenger trunk lines. These findings proceed from an analysis of the laws governing passenger traffic flows, from the pattern of housing zones in the GFR, and from the relationships of running dynamics between maximum speed and distances between stops. [German]

Breimeier, R *Eisenbahntechnische Rundschau* Vol. 25 No. 12, Dec. 1976, pp 727-735, 7 Fig., 3 Tab., 12 Ref.

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

DOTL JC

23 157939

**THE LINK BETWEEN THE NEW MUNICH AIRPORT AND THE S-BAHN NETWORK [Der Anschluss des neuen Verkehrsflughafens Muenchen an das S-Bahnnetz Muenchen]**  
No Abstract. [German]

Werler, R *Die Bundesbahn* Vol. 53 No. 1, Jan. 1977, pp 15-24, 1 Fig., 1 Tab., 1 Phot.

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

23 157963

**OPTIMAL TRANSIT PRICES UNDER INCREASING RETURNS TO SCALE AND A LOSS CONSTRAINT**

The optimal/pricing for transport on different modes uses as examples the Bay Area Rapid Transit and the Alameda-Contra Costa Transit which provide rail transit and bus service, respectively, to a portion of the San Francisco region. The welfare maximization process developed by Bioteux for the French National Railways is followed by a modal choice procedure to estimate marginal and average costs. The cost estimates are used to estimate prices which should be charged by BART and AC Transit.

Research sponsored in part by grants from the National Science Foundation.

Train, K (California University, Berkeley) *Journal of Transport Economics and Policy* Vol. 11 No. 2, May 1977, pp 185-194, 1 Fig., 13 Ref.

ORDER FROM: London School of Economics and Political Science, Houghton Street, Aldwych, London WC2A 2AE, England

DOTL JC

23 158193

**THE HIGH SPEED TRAIN**

The vice chairman of the British Railways Board discusses the High Speed Train and BR's strategy for its intercity passenger services. The train is a combination of lightweight traction and the most comfortable coaches to be developed. The roles of service, scheduling and the next generation--the Advanced Passenger Train--are all discussed.

Lawrence, RLE (British Railways) *Chartered Institute of Transport Journal* Vol. 37 No. 9, Mar. 1977, pp 269-262, 2 Phot.

ORDER FROM: Chartered Institute of Transport, England, 80 Portland Place, London W1N 4DP, England

23 158207

**A SURVEY OF RAIL PASSENGER TRANSPORTATION**

This study is designed to provide data relevant to the rail passenger sector for an intermodal National Transportation Policy Study. The current state of technology in the Canadian Rail passenger sector is described against a background of current and emerging technology worldwide. This review includes rolling stock, right of way, communications and control, terminals, procedures and regulations. A quantitative and qualitative assessment of the current performance of the sector includes development of a hypothetical cost model for use in analyzing technological alternatives. Expectations for such change in the 1975-1990 period are then described. The final section utilizes the previously developed cost model to analyze the alternatives. The study is a general and not route-specific examination.

Sponsored by the Transportation Research & Development Center, Canada.

Ganton, TD Macdonald, JA Lake, RW Law, CE Rice, RA Bliemel, F  
Canadian Institute of Guided Ground Transport, (Project 8.40.75)  
CIGGT-75-3, Mar. 1975, 292 pp, Figs., Tabs., Apps.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

**23 158301****RECENT DEVELOPMENTS IN URBAN BUS TRANSIT**

Problems associated with replacing street cars with buses, improving bus transit by preferential treatment, ramp and land metering, and reserved freeway lanes are discussed. Comparison is made between rail and bus rapid transit. Examples of priority bus lanes on arterial streets are presented. Terminals, special services and technology are covered.

Hoel, LA (Virginia University) *Transportation Planning and Technology*  
Vol. 3 No. 4, 1977, pp 257-266, 18 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

**23 159478****ANALYSIS OF CHANGES IN RAIL COMMUTING TO CENTRAL LONDON, 1966-71**

Using the population census data for 1966 and 1971 an analysis was made of the way in which rail commuting to central London from a number of local authority areas has changed between these two years. The results of the multiple regression suggest that changes in rail journey time are more important to passengers than changes in frequency. An overall elasticity with respect to journey time of -0.6 (-0.9 for long journeys and -0.5 for short journeys) was obtained, whereas that with respect to frequency was not significantly different from zero. It was not possible to estimate the way rail passengers respond to fare changes owing to insufficient variation in fare levels over the local authority areas during the period. The inclusion of socio-economic variables such as car-ownership, the size of the local labour force and the number of owner-occupied houses in each local authority area improved the fit of the equation but did not tend to affect the absolute or relative size of the rail service elasticities. /Author/TRRL/

Hepburn, DRC

Transport and Road Research Laboratory Monog Rpt. TRRL-SR-268,  
1977, 12 pp, 6 Tab., 7 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-225885)

ORDER FROM: TRRL

**23 159480****REACTION OF THE PUBLIC TO FULLY AUTOMATED URBAN TRANSPORTATION SYSTEMS**

The experience gained with the automatic systems developed by Matra for the city of Lille (VAL light subway) and for the RATP of Paris (ARAMIS system), allows conclusions to be drawn on the studies made, arrangements taken and tested on operating sites, and the results of psychological polls carried out. In particular, detailed data is given on the proposed means of informing the public about the Lille subway and also on the arrangements to be taken for the construction of stations.

Presented at the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976. Also available from ESL.

Felix, B (Engins Matra, France)

International Federation of Automatic Control Conf Paper 1976, pp  
229-236

ACKNOWLEDGMENT: EI (EIX770400464)

ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

**23 159482****QUEUEING THEORY APPROACH TO RAILWAY CAPACITY IN URBAN COMMUTER RAILWAYS**

The method proposed is a mixture of stochastic and diffusion type mathematical approximations to describe the queue length, delay and relaxation times found in the operation of the section. It is the perturbations in the times between trains and in the station stop times that give rise to queueing and the delays on the trains. The traffic intensity and a queue growth factor are key parameters in determining the practical capacity which is related to the deterministic or basic capacity, a concept derived entirely from the signaling characteristics of the station layout.

Presented at the INFAC/IFIP/IFORS International Symposium: Control in Transportation Systems, Columbus, Ohio, August 9-13, 1976. Also available from ESL.

Rice, P (University College, London)

International Federation of Automatic Control Conf Paper 1976, pp  
267-276

ACKNOWLEDGMENT: EI (EIX770400438)

ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

**23 159487****MULTINOMIAL LOGIT APPROACH FOR MULTIMODAL CHOICE OF WORK TRIPS**

This paper reports the results of an explorative study on the possibility of using a multinomial logit model to replicate and predict multimodal choice for work trips in a Canadian urban context. Modal choice data from Toronto, where a multimodal choice situation exists in the line-haul portion of the work trip, are used to develop the model. The developed model is evaluated in terms of statistical criteria and reasonableness tests. It is further examined for its predictive ability by the results with the published ones in this area. The study shows that disaggregate models can provide reasonable results when used in forecasting the modal choice between various modes.

Cherian, V (Calgary University, Canada); Sargious, MA *Canadian Journal of Civil Engineering* Vol. 4 No. 1, Mar. 1977, pp 10-17, 17 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

24 138131

**LABOR IN THE TRANSIT INDUSTRY**

This examination of employment and compensation trends, labor/management relations, government involvement and employee productivity, found that management (which comprises 15 percent of the workforce) receives inadequate attention, and that labor compensation comprises approximately 65 percent of the industry's operating costs. It urges that Congress should expand Urban Mass Transportation Administration funding of management related programs to remedy the situation regarding recruitment and training of management personnel. Transit union activity related to compensation should be closely monitored by UMTA. The implications of Section 13(C) of the Urban Mass Transportation Act of 1964 are covered and the role and impact of paratransit service is considered. Labor productivity is examined and it is noted that while neither system size nor ownership have a significant effect on labor productivity, work rules and compensation patterns exert a major influence on productivity.

Lieb, RC (Northeastern University)

Department of Transportation DOT/TPI/10-77/02, May 1976, 102 pp, 9 Tab., Refs., 5 App.

ACKNOWLEDGMENT: NTIS, Monthly Catalog of US Government Publications, GPO (TD 1.2:L 11/2)

ORDER FROM: NTIS, GPO

PB-265235/2ST, DOTL NTIS, S/N-050-000-00119-9

24 146512

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK 1: MANAGEMENT SURVEY SUMMARY REPORT**

The summary report presents an overview of the organizational structure and construction management function of several, largely transportation oriented, construction projects. The nine organizations surveyed were: (1) Alyeska Pipeline Service Company, (2) Bay Area Rapid Transit District, (3) Chicago Transit Authority/Chicago Urban Transportation District, (4) Dallas-Fort Worth Regional Airport, (5) Federal Highway Administration/New York State Department of Transportation, (6) Metropolitan Atlanta Rapid Transit Authority, (7) Massachusetts Bay Transportation Authority (8) Naval Facilities Engineering Command/Trident Project, and (9) Washington Metropolitan Area Transit Authority. The data reported focuses on six major topics for each organization. They are: (1) project and organization background and overview, (2) funding and budgeting considerations, (3) project management and project monitoring, (4) construction project management, including cost and schedule controls, (5) management information systems, and (6) institutional considerations.

Also available in set of 3 reports PC-E09, PB-259983-SET.

Gracaliese, A Albin, PA DiLuzio, RG

Dynatrend, Incorporated, Federal Railroad Administration Final Rpt. NEC-PAA-75-194, FRA/NECPO-76/1, Dec. 1975, 155 pp

Contract DOT-FR-56007

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-259984/3ST, DOTL NTIS

24 146513

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK 2: DEVELOPMENT OF PROGRAM MANAGEMENT ORGANIZATION STRUCTURE SUMMARY REPORT**

The report recommends two Program Management Organization structures for the complex, \$2.0 billion Northeast Corridor Improvement Program. Highlights of the structure development process include: (1) understanding the complex, changing, unstructured environment that the Program Management Organization must operate within; (2) developing basic assumptions regarding participants, roles, and responsibilities; and (3) reflecting the capabilities of the Federal Railroad Administration and the other key participants.

See also Task 1, PB-259984. Also available in set of 3 reports PC-E09, PB-259983-SET.

Massa, RJ Sherman, RA Polutchko, JA

Dynatrend, Incorporated, Federal Railroad Administration Final Rpt. NEC-RJM-76-200, FRA/NECPO-76/2, Jan. 1976, 133 pp

Contract DOT-FR-56007

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-259985/0ST, DOTL NTIS

24 146514

**NORTHEAST CORRIDOR IMPROVEMENT PROGRAM. TASK 3: MANAGEMENT PLANNING AND CONTROL SYSTEM SUMMARY REPORT**

The Northeast Corridor Improvement Program (NECIP) has as its primary goal the improvement of the intercity passenger rail system between Washington and Boston in order to maximize the use of the rail capability in meeting present and future transportation demands. The NECIP Management Planning and Control System (MPCS) consists of those planning, estimating, progress measuring, reporting, evaluation, and replanning functions required to design and construct the improvements within established schedule, cost, and performance parameters. Included in the MPCS are the policies, methods, procedures, reports, and data needed to accomplish and record the above functions and the automated Management Information System which assists in this process.

See also Task 2, PB-259985. Also available in set of 3 reports PC-E09, PB-259983-SET.

Polutchko, JA Sherman, RA Hafer, F LePage, R

Dynatrend, Incorporated, Federal Railroad Administration Final Rpt. NEC-JAP-75-199, FRA/NECPO-76/3, Mar. 1976, 204 pp

Contract DOT-FR-56007

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-259986/8ST, DOTL NTIS

24 147057

**NET PRESENT VALUE ASSESSMENT OF THE FEDERAL COAL RAILBANK**

As a result of the Regional Rail Reorganization of 1973, hundreds of miles of light-density rail lines located in coal-rich reserve areas in the Northeast have been excluded from the new railway system called ConRail. In order to preserve such lines for future use and thus avoid a potential restriction on energy development, the Rail Revitalization and Regulatory Reform Act of 1976 provides for the establishment of a Federal Coal Railbank. The purpose of the Railbank is to acquire and hold these lines for potential future use, thereby preserving access to vital coal reserves expected to be developed over the next twenty-five years. This study was commissioned to investigate the economic feasibility of the Railbank concept to determine the benefit to the U.S. public of acquiring the lines. Portions of this document are not fully legible.

Policy Research Associates, Federal Energy Administration  
FEA/G-76/440, July 1976, 148 pp

Contract FEA-CO-05-60502-00

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-258586/7ST, DOTL NTIS

24 148596

**A PROPOSAL FOR THE DEVELOPMENT OF AN INTERSTATE RAIL SYSTEM. SUMMARY**

The proposed Interstate Rail System is the result of an effort to develop an optimal national railroad network. The Interstate Rail System would consist of selected segments of existing railroad lines, chosen to function as the primary main line routes for the nation. The routes included in the System would be improved to the best feasible engineering standards. The proposed Interstate Rail System consists of 42,418 miles of line, about 21 percent of the nation's railroad network. The System reaches all 48 adjacent states and all standard consolidated statistical areas (SCSAs) and nonconsolidated standard metropolitan statistical areas (SMSAs) in the adjacent states. The SCSAs and SMSAs contain about 73 percent of the population of the adjacent United States. The System involves the tracks of 34 railroads. The accompanying maps show the routes of the proposed System.

This document summarizes a doctoral dissertation prepared by the author; it consists of an abstract and proposed Interstate rail route maps. Summary only is available at the DOTL.

Zlatkovich, CP  
Texas University, Austin Dec. 1976, 9 pp, 8 Fig.

ORDER FROM: University Microfilms International, 300 North Zeeb Road,  
Ann Arbor, Michigan, 48103

DOTL RP

**24 148607**  
**SOME THOUGHTS ON THE TRAINING AND CAREER DEVELOPMENT OF THE CHARTERED ENGINEER IN THE RAILWAY INDUSTRY**

Graduate engineer training in the Railway Industry over the past fifteen years is described; the need for formal training related to the problems of changing technology, and practical applications are gone into.

Hardy, RHN *Institution of Mechanical Engineers Proceedings* Proceeding  
Vol. 190 No. 28, 1976, 8 pp

ACKNOWLEDGMENT: UIC  
ORDER FROM: ESL

DOTL JC

**24 148809**  
**RAILROAD ABANDONMENTS AND ALTERNATIVES: A REPORT ON EFFECTS OUTSIDE THE NORTHEASTERN REGION**

No Abstract.

A report of the Secretary of Transportation to the U.S. Congress, pursuant to Section 904 of the 4R Act.

Department of Transportation Cong. Rpt. TD 1.2:R 13/4, 1976, 122 pp,  
Figs., Refs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications  
(76-9685)  
ORDER FROM: DOT

DOTL

**24 149420**  
**THE FUTURE OF METRE GAUGE [L'avenir de la voie metrique]**

After stressing the fact that metre gauge represents at present slightly more than 20% of the total railway track in the world, but with a proportion varying considerably in each of the main continental areas, the author studies the reasons for this state of affairs and gives some significant examples of performances achieved by various metre-gauge railways. He points out that comparative studies in numerous cases confirm that, when speed is not a main aim, major savings can be made as regards track layout with metre gauge. As far as the criterion governing choice is concerned, it must be taken on the basis of the idea of compatibility between networks.

Fontgalland, B de *Rail International* Vol. 7 N No. 1, Nov. 1976, pp  
605-608, 2 Fig., 2 Phot.

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

DOTL JC

**24 149426**  
**THE DYNAMOS PROJECT. DYNAMIC MODELLING AS A METHOD OF TRAFFIC FORECASTING, AS ILLUSTRATED BY THE EXAMPLE OF THE HSB HIGH-CAPACITY, HIGH-SPEED RAILWAY [Projekt Dynamos. Die dynamische Modellierung als Methode der Verkehrsprognose, dargestellt am Beispiel der Hochleistungsschnellbahn HSB]**

A summary of the study ordered by the Federal German Republic's Minister of Transport. The study is in three volumes: 1. Passenger traffic (307 pages); 2. Freight traffic (80 pages); 3. Appendices (117 pages). Based on total transport volume figures, the study makes use of a dynamic model in an attempt to predict how passenger and freight traffic will be distributed among the different transport modes by 1995, for a partial sector of the FGR limited in space. [German]

*Internationales Verkehrswesen* Vol. 28 No. 4, July 1976, pp 191-193

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

**24 149458**  
**THE TRANSFORMATION OF A RAILROAD**

The ten-year transformation of the Illinois Central Railroad into IC Industries, a diversified conglomerate, is described. Between 1966 and 1975, revenues grew from \$300 million to \$1.5 billion and currently most pretax earnings are from nonrail enterprises. In addition to merging Gulf, Mobile and Ohio Railroad, IC Industries has holdings in heavy industry, real estate, consumer products and financial enterprises. The planning and corporate restructuring are described.

Johnson, WB (IC Industries, Incorporated) *Long Range Planning* Vol. 9  
No. 6, Dec. 1976, pp 18-23, 5 Fig.

ACKNOWLEDGMENT: Long Range Planning  
ORDER FROM: ESL

DOTL JC

**24 149462**  
**FINAL STANDARDS, CLASSIFICATION, AND DESIGNATION OF LINES OF CLASS I RAILROADS IN THE UNITED STATES. VOLUME 1**

This report makes three basic modifications in Preliminary Standards, Classification and Designation of Lines of Class I Railroads in the United States (RRIS 139937). Such standards are required by the Railroad Revitalization and Regulatory Reform Act of 1976. The modifications are: (1) Neither final density standard or any other standard considers passenger traffic; (2) the defense-essential standard has been totally revised to include not only branchlines serving defense installations but also needs for a national network of interconnected high-density mainlines; (3) a classification standard for abandonment and rail service discontinuance based on revised RSPO and ICC requirements. The final standards have been applied to classify the rail system into six distinct categories embracing both mainline and branchlines.

See also Preliminary Standards, RRIS 24 139937, 7701, and Volume 2 (Interim) RRIS 24 152670, 7702.

Department of Transportation Jan. 1977, 112 pp, Figs., Tabs., 4 App.

ACKNOWLEDGMENT: DOT  
ORDER FROM: DOT

DOTL RP

**24 149945**  
**THE QUADRUPLING OF THE ROME-FLORENCE RAILWAY LINE [Il quadruplicamento della linea ferroviaria Roma-Firenze]**

This article discusses the planning criteria behind a new rail link, now under construction, which will quadruple the Rome-Florence rail service. Design and construction details are also given of the new itinerary and its main structures, (tunnels, viaducts, embankments and cuttings), and costs are compared for various sections of the line with different terrain characteristics. The new line, 260 km long, is intended for mixed operation (fast and slow trains), and is designed to allow for development to accommodate ultra high speed trains. /TRRL/ [Italian]

Ruoppolo, G *Rivista della Strada* Vol. 45 No. 422, Sept. 1976, pp 817-832,  
5 Fig., 4 Tab.

ACKNOWLEDGMENT: TRRL (IRRD 223948)  
ORDER FROM: Casa Editrice la Fiaccola, Via Ravizza 62, Milan, Italy

**24 149997**  
**THE INDUSTRY THAT BUILT THE COUNTRY**

150 years ago the chartering of the Baltimore and Ohio Railroad marked the beginning of the American railroad industry. The B&O still operates today, as part of the Chessie System, under its original charter; it is one of the biggest and most profitable of all American Railroad Systems. The article reviews the historic role of the railroad, and outlines the reasons for the continuing success of the company.

Shedd, T *Modern Railroads/Rail Transit* Vol. 32 No. 2, Feb. 1977, pp  
62-65, 1 Fig., 3 Phot.

ACKNOWLEDGMENT: CNR  
ORDER FROM: Cahners Publishing Company, Incorporated, Watson Publications,  
5 South Wabash Avenue, Chicago, Illinois, 60603

DOTL JC

24 152445

**INTERNATIONAL SCIENTIFIC AND TECHNICAL COOPERATION OF THE SOVIET UNION IN RAILWAY TRANSPORT**

The author, Vice-Minister of Transport in the USSR, describes present conditions on his network, its technical performance and major achievements, and then lists the international cooperation operations in which the Soviet Railways are engaged: Participation in the OSJD and the main organisations set up under it, participation in UN transport Commissions, and in the International Railway Congress Associations, and bilateral relations with the SNCF and French Ministry of Transport, with Canada, cooperation agreement with the USA signed in 1973 and its applications.

Gundobin, NA *Rail International* Vol. 7 No. 10, Oct. 1976, pp 541-545

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

DOTL JC

24 152452

**CONCERNING THE MAKE-UP OF THE WAGON FLEET [Zur Dimensionierung des Gueterwagenparks]**

The demand for transport is the departure point for determining the make-up of the wagon fleet and the author gives some of the main aspects that have to be taken into consideration to arrive at quantitative and qualitative decisions. He also outlines some possible developments. [German]

Queisser, H *DDR-Verkehr* Vol. 9 No. 8, Aug. 1976, pp 317-322, 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Transpress VEB Verlag fuer Verkehrswesen, Franzoesische Strasse 13-14, 108 Berlin, East Germany

24 152655

**TRANSPORTATION-UTILITY CORRIDORS: ARE THEY PRACTICAL?**

The creation of transportation-utility corridors has a great deal of political and public appeal. Each system has its own unique problems and these problems, in most cases, are different from, as well as being incompatible with, any other systems. This paper addresses the problems unique to the railroad industry when adjacent to other utilities and the necessity of taking a total system approach for all the particular problems of all the modes involved.

Prepared for IEEE-sponsored Meeting, New Orleans, Louisiana, December 1-3, 1975.

Robertson, HM (Association of American Railroads) *National Telecommunications Conference, 1975, Proc Proceeding* Session 4, 1975, pp 10-13, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

24 152658

**A CASE OF RAILWAY MANIA**

Not only is today's railroad route mileage greatly in excess of existing transportation requirements, but the author states that the railroad system was overbuilt even by the requirements of its own era. Exaggerated ideas of traffic to be developed, regional and municipal rivalries and an excessive spirit of competition all contributed to gross overbuilding. Excessive duplication of facilities has weakened certain parts of the U.S. railroad system ever since. The author traces the construction and abandonment of railroads in western New York State to illustrate his point. The deleterious effects of overbuilding practically made Conrail and its consolidations and abandonments inevitable, he concludes.

Shaw, RB (Clarkson College of Technology) *Trains* Vol. 37 No. 7, May 1977, pp 22-27, 5 Phot.

ORDER FROM: Kalmbach Publishing Company, 1027 North Seventh Street, Milwaukee, Wisconsin, 53233

DOTL JC

24 152666

**FACTORS AFFECTING THE ABANDONMENT AND SURVIVAL OF CLASS II RAILROADS**

This study compares the financial and traffic data for a sample of Class II railroads abandoned between 1935 and 1968 with data for a sample of light-traffic Class II railroads still in operation in 1975 to gain information about the factors that influence the ability of short line railroads to survive. The traffic patterns, maintenance practices, profitability, causes for abandonment, possible viability of those shortlines abandoned and results of transferring Class I railroad branch lines to shortline management are examined.

Due, JF (Illinois University, Urbana) *Transportation Journal* Vol. 16 No. 3, Mar. 1977, pp 19-36, 1 Fig., Tabs., 4 Ref.

ORDER FROM: ESL

DOTL JC

24 152670

**FINAL STANDARDS, CLASSIFICATION, AND DESIGNATION OF LINES OF CLASS I RAILROADS IN THE UNITED STATES. VOLUME 2 (INTERIM)**

Interim Volume II contains designations of all Class I Railroad lines in the U.S., based upon the standards developed in Volume I. Each line segment was subjected to individual analysis, using the most current information available. Statistical summaries of route mileage by line designation are presented, along with cross-reference information. Following the tables is an enlarged national network map. There are 132 sector maps to display specific line information.

See also Volume 1, RRIS 24 149462 7702, and Preliminary Standards, RRIS 24 139937 7701.

Federal Railroad Administration, (RPD-20) *Intrm Rpt.* Vol. 2, Jan. 1977, 204 pp, Figs., 4 Tab., 4 App.

ORDER FROM: GPO

DOTL TF153.U582.V2

24 153056

**A CHIEF ENGINEER'S CREED**

The author stresses the importance of immediate emphasis on railroad maintenance as well as on R&D in maintenance equipment design and the effects of track-train dynamics. Four major qualifications of a maintenance officer should be: (a) a total and intimate knowledge of the railroad property; (b) familiarity with the staff; (c) a knowledge of inherent maintenance problems; (d) the aptitude to be a super planner. The author concludes by insisting on the importance of procuring and continually training qualified staff.

Gordon, BJ (ConRail) *Progressive Railroadng* Vol. 20 No. 3, Mar. 1977, pp 39-41, 5 Phot.

ACKNOWLEDGMENT: CNR

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

DOTL JC

24 153388

**BRAZIL**

Most of this issue of IRJ is devoted to RFFSA plans for Brazilian railways, especially important projects like the new "steel railway" which will take Minas Gerais ore for processing and export to Volta Redonda.

*International Railway Journal* Jan. 1977, p 17

ACKNOWLEDGMENT: British Railways

ORDER FROM: Simmons-Boardman Publishing Corporation, 508 Birch Street, Bristol, Connecticut, 06010

DOTL JC

24 153398

**INCREASING EFFECTIVENESS BY GROUP DISCUSSION AND PARTICIPATION**

In most large organizations top management simply doesn't know what subordinate managers are doing, or how effectively they are spending their time. This paper opens with this controversial statement and then suggests a practical method of establishing strategic priorities and key performance

areas which involved group discussion and participation. It is claimed that this new method offers distinct advantages over more orthodox approaches.

Schutte, FG *Journal of General Management* Vol. 4 No. 1, Sept. 1976, pp 31-45

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Mercury House Publications Limited, Mercury House, Waterloo Road, London SE1 8UL, England

24 154857

**THE LEGAL FRAMEWORK FOR COLLECTIVE BARGAINING IN THE URBAN TRANSIT INDUSTRY**

This report is part of a general study of labor relations in urban transit financed by the Urban Mass Transportation Administration (UMTA). The general study will be submitted to UMTA as four separate reports. The purpose of the study is to analyze labor relation trends in municipal bus systems, to identify the determinants of wage rates and labor costs, and to examine the impact of governmental assistance programs on collective negotiations. This report analyzes the legal framework of collective bargaining in local transit within the private-public transition period of transit systems.

Stern, JL Miller, RU Rubinfeld, SA Olson, CA Heshizer, BP Wisconsin University, Madison, Urban Mass Transportation Administration, (UMTA-WI-11-0004) Final Rpt. UMTA-WI-11-0004-77-1, No Date, 196 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-266110/6ST, DOTL NTIS

24 154858

**FACTORS INFLUENCING THE ADOPTION OF MANAGEMENT INNOVATIONS IN THE CTA**

The process of management innovation in one transit property, the Chicago Transit Authority (CTA), is examined. The purpose of the study is to identify those factors of greatest relevance to innovation in organizations and to describe the extent to which those factors have helped the CTA to innovate successfully. Specifically, the research effort is designed to assess the environmental, organizational, linking, and attitudinal factors related to the recent adoption by the CTA of two management innovations: (1) Bus Utilization System, and (2) Microfiche viewers in the Travel Information Center. Both innovations significantly affect decision processes and have present and potential advantages for transit management. Data were collected from institutions and from structured interviews and questionnaires administered to persons closely involved with the development and use of the two innovations. (Data collection tools are contained in the Appendix.) Results show that the organization structure of the CTA had a positive influence on the adoption of both innovations.

Robey, D Bakr, MM Marquette University, Urban Mass Transportation Administration UMTA-WI-11-0002-77-1, 114 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-266154/4ST, DOTL NTIS

24 156875

**JERVIS LANGDON JR. CONTEMPLATES CONRAIL**

As chief executive officer of Penn Central the author led an attempt by trustees to increase traffic density by abandoning about half of the operations but retaining about 87 percent of the business and by increasing volume through promotion of increased piggyback business. The "core" concept was politically unacceptable and piggyback marketing by competitors rendered PC's efforts at trainload volumes a failure. The author avers that Conrail inherits PC's problems and only secures added time for development of a pared-down truly transcontinental rail system where six competitive units are maintained.

Langdon, J, Jr *Trains* June 1977, pp 40-41, 1 Tab., 1 Phot.

ORDER FROM: Kalmbach Publishing Company, 1027 North Seventh Street, Milwaukee, Wisconsin, 53233

DOTL JC

24 156893

**RAILROADS AND THE ECONOMY**

This issue of "The Logistics and Transportation Review" is devoted to the subject of railroads and the economy and comprises the following articles: Railroads and the economy by Ruppenthal, KM; Implications of the local rail assistance section of the Railroad Revitalization and Regulatory Reform Act of 1976 by Baumel, P, Drinka, TP and Miller, JJ; Competitive forces affecting Canadian rail rates through shipper-carrier negotiations by Heaver, TD; The impact of waterway user charges on grain and fertilizer transportation in central Illinois by Bunker, AR; Replacement value costing concepts and methodology--freight car costing by Lake, RW and MacDonald, JA; A statistical analysis of the Canadian railway rate structure, Heaver, TD and Oum, TH; Input functions in rail transport--some conceptual issues by Studnicki-Gizbert, KW. /TRRL/

*Logistics and Transportation Review Analytic* Vol. 12 No. 5, 1976, pp 291-401, Figs., Tabs., Refs.

ACKNOWLEDGMENT: TRRL (IRRD-225521)

ORDER FROM: British Columbia University, Canada, Faculty of Commerce, Vancouver 8, British Columbia, Canada

24 157218

**RAIL TRANSPORT RESEARCH NEEDS**

The Transportation Research Board undertook this study at the request of the Federal Railroad Administration and Association of American Railroads to develop a comprehensive framework for a coordinated national research effort by industry and government and to suggest priorities. The goal would be a research program of maximum assistance in improving the performance and viability of the rail industry and the decision-making processes of those involved with rail transport. Chapters discuss the problems external and internal which affect the industry: Environment for Rail Transport; Private and Public Roles in Rail Transport; Transport Policy Problems; Regulatory Problems; National Transportation Problems; Finance; Marketing; Costing; Personnel and Human Factors; Organization; Operations; Plant and Equipment; Management Information and Control Systems. The final two chapters discuss R&D strategy. New programs should be built on programs now underway in government and industry--augmenting rather than replacing present efforts. The conclusion is that survival issues for the rail industry are concentrated in management and planning--the "soft" side of research. While technological research is recommended, cost-reduction, improved service to shippers and more effective marketing are keys to survival and health.

Final report of the Railroad Research Study conducted by the Transportation Research Board and sponsored by the Federal Railroad Administration and the Association of American Railroads.

*Transportation Research Board Special Reports* Final Rpt. Special Report 174, 1977, 80 pp, 1 Tab., 160 Ref., 1 App.

ORDER FROM: TRB Publications Off

DOTL RP

24 157221

**THE RAILWAY GAME: STUDY IN SOCIO-TECHNOLOGICAL OBSOLESCENCE**

Canadian, with more track per capita than any other nation, has special problems along with those common to other railway systems including railroads elsewhere in North America. Politics and regulation have had special implications for Canadian railways. The author observes that the North American public, governments, railways, politicians, transportation specialists and media tend either to be sentimental and naively optimistic, or conservative and negative about railroading; the attitude is divorced from technological and economic realities. The goal is not to lay blame but to demonstrate deficiencies of the railway transportation system and further the reforms which are so long overdue. The book is divided into four sections: Orgins of the Malaise; State of the Art; Future Directions; and Obstacles to Modernization.

Issued under the editorial supervision of the Institute of Canadian Studies, Carleton University, Ottawa, Canada.

Lukasiewicz, J McClelland and Stewart Limited, (ISBN-0-7710-9905-3) Monograph 1976, 319 pp, 21 Fig., 30 Tab., Refs., 2 App.

ORDER FROM: McClelland and Stewart Limited, 25 Hollinger Road, Toronto, Ontario, Canada

24 157235

**COST-BENEFIT ANALYSIS, GOVERNMENT POLICY AND THE BRITISH RAILWAY NETWORK**

In 1963 the Beeching Report on Britain's railways proposed the closure of a substantial part of the railway network (British Railways Board, 1963). Although many services were withdrawn, disquiet at the Report's failure to analyse the social benefits of rail passenger services eventually led to the application of the technique of cost-benefit analysis to the problem of unremunerative rail services. However, although such studies revealed that the retention of many rural rail services could not be justified on social grounds, these services were not withdrawn. This paper outlines briefly the history of attempts to deal with the question of the "optimal size" of the rail passenger network. Secondly, it considers the social cost-benefit case for reducing the present size of the network in Britain and the quantifiable benefits from such a reduction. The problem of joint costs is discussed. Finally, it attempts to explain the failure of successive Governments to apply the results of cost-benefit studies in practice, and suggests how the decision-making process might be altered to facilitate a more rational approach towards public transport problems in Britain.

Dodgson, JS (Liverpool University, England) *Transportation (Netherlands)* Vol. 6 No. 2, June 1977, pp 149-170, 2 Tab., Refs.

ACKNOWLEDGMENT: Transportation (Netherlands)  
ORDER FROM: ESL

DOTL JC

24 157238

**NORTHERN RAILWAY OPTION**

The author points out that the principal economic advantage of a railway over other modes of transportation of oil and liquefied natural gas from the Arctic lies in its flexibility. A number of railways currently operate in regions of permafrost and one has been doing so for more than forty years. Railway rationale, construction, technology, implementation, economics, etc., are discussed in this article.

Lake, RW (Queen's University, Canada); Roney, MD *Engineering Journal (Canada)* Vol. 59 No. 2, Mar. 1976, pp 28-30

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

24 157665

**THE GREAT BIG RAILROAD THAT COULD**

Union Pacific has diversified by concentrating on areas where already it had some involvement, rather than becoming a conglomerate of the type that has brought other firms to financial grief. The management decisions that led to exploitation of UP's natural resources potential are described. Today the firm has three major operations-- railroad, land, and natural resources. The railroad is noted for its lack of deferred maintenance, modern facilities and high efficiency.

Flaherty, RJ *Forbes* Vol. 119 No. 11, June 1977, pp 37-42, 1 Fig., Photos.

ORDER FROM: Forbes Incorporated, 60 Fifth Avenue, New York, New York, 10011

DOTL JC

24 157666

**MANAGING ENGINEERING PROJECTS-RE FORUM PAPERS**

The Railway Engineers' Forum session on major multi-discipline projects reviewed seven such activities in the United Kingdom and overseas. The seven projects are discussed from the development phase through implementation, including the relationship between physical progress and financial control and the control from the point of view of the operator. The operator is usually required to be running his existing service while a major engineering project is going forward on his property. The projects: The Hong Kong Metro; The discontinued Channel Tunnel scheme; The West Coast electrification; The signal engineer's viewpoint; Project management of the Annaba steel complex; The operating view; The GN suburban electrification.

Presented at a Railway Engineering Forum meeting held at the Institution of Civil Engineers in London, Feb. 17, 1977.

*Railway Engineer* Proceeding Vol. 2 No. 3, May 1977, pp 21-39

ORDER FROM: ESL

DOTL JC

24 157706

**BUNDESBAHN QUO VADIS?**

The author applies himself to the future of public transport services in a free market economy. Upon the answer to this question depends also the future of the German Federal Railway (I). After a review of the railways in Germany since the 1930s (II-IV), the latest efforts to restore the DB to a sound financial state are discussed (V and VI). In conclusion, these are presented on the position as it is now and the prospects for improvement (VII). The basic condition for a change in the economic fortunes of the railways is better capacity utilization. Demand can be stimulated by improving competitiveness and by changing transport distribution policies in their favor. But even railways that are more competitive and assisted by transport policies can hardly any longer be operated at a profit. This is also shown by a calculation on an optimal operating network presented by DB. The main reason is the ease with which users can change to independent transport (works-owned vehicles, the private car). The support which could be given to the national railways by way of transport policy is partly financial, partly organizational. Resort must be made to subsidies to the extent to which organizational remedies are dispensed with, if the railways are to continue in existence. The main organizational possibilities of assisting the railways and reducing their need for subsidies are by way of making private business costs out of the national economic costs attributable to the railways' competitors in respect to accident proneness, energy consumption, space used, wear and tear on roads, etc. [German]

Oettle, K *Eisenbahntechnische Rundschau* Vol. 26 No. 4, Apr. 1977, pp 239-245

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

DOTL JC

24 157909

**NATIONAL FREIGHT CORPORATION 1975**

This annual report describes 1975 as the Corporation's most difficult year, and although British road services, Pickfords removals, heavy haulage, and travel produced record profits, these were more than offset by the heavy loss of national carriers. The report gives a review of the trading operational of each company in the Corporation and blames the losses partly on the economic recession and partly on the burdens transferred from the railway companies to the Corporation at its formation in 1968. Other activities of the Corporation described include its part in environmental conservation and its technical resources. The report contains details of the accounts and supporting statements for the year. In addition to statements of the overall profit and loss the financial results for each subsidiary are presented individually. /TRRL/

National Freight Corporation Monog Rpt. May 1976, 56 pp, Tabs.

ACKNOWLEDGMENT: TRRL (IRRD 224371)  
ORDER FROM: National Freight Corporation, Argosy House, 215 Great Portland Street, London, England

7606006

24 157912

**RAILWAY TECHNOLOGY IN 20 YEARS' TIME [L'image technique des chemins de fer dans 20 ans]**

Currently developing trends are projected into the future and an image of railway technology is created as it might appear in twenty years' time. New inventions are not considered except in instances where plans exist for building prototypes. This realistic approach should contribute to careful coordination of in-depth technical research. [French]

Toegel, A  
International Union of Railways, (UIC cat. 030-N-35) Tech. Rpt. ORE-DT/46, Jan. 1976, 46 pp, 7 Ref.

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



24 157915

**A WORKSHOP AND RUNNING SHED DEPARTMENT, ESSENTIAL FOR THE DB [Werkstaettendienst--fuer die DB unentbehrlich]**

All research done in the past has led to the conclusion that the railway, as a modern technical undertaking, cannot do without its own workshops. There are very serious arguments against changing the system and having a legally independent subsidiary instead. [German]

*Verkehrswirtschaftliche Informationen* No. 20-1, 76, pp 25-27

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: *Verkehrswirtschaftliche Informationen*, Frankfurt am Main, West Germany

24 157951

**TEXAS RAILROADS: AN EVALUATION**

This summary report highlights information from 20 special reports covering various aspects of railroad operation in Texas. The major objective is to provide facts and information for use in establishing a state policy for the continuation of a privately owned railroad system necessary to meet the total transportation need of the citizens of Texas. It provides reference material useful to current legislative issues involving energy, taxes, safety, transportation financing, state rail planning and economic regulation.

Sponsored by the Texas State Legislature.

Texas Transportation Institute Tech. Rpt. No Date, 102 pp, 16 Fig., 37 Tab.

ACKNOWLEDGMENT: Texas Transportation Institute  
ORDER FROM: Texas Transportation Institute, Texas A&M University, College Station, Texas, 77843

24 157964

**A SIGNAL FOR TOMORROW**

The status of the industry in 1977, identification of the problems which confront railroads in the general transportation environment, and predictions about the future course of the industry highlight this special report.

Welty, G *Railway Age* Vol. 178 No. 8, Apr. 1977, pp 27-36, Figs., Photos.

ORDER FROM: ESL

DOTL JC

24 157968

**WOULD LIMITS ON DIVERSIFICATION PUT MORE MONEY INTO THE RAILROADS**

This article examines the appropriateness of tightening the regulatory restrictions to inhibit the diversification activities of railroad holding companies as a safeguard against further disinvestment in rail service through diversion of assets of the railroad subsidiaries. Based on the experience in other regulated industries such as public utilities and banking, where the holding company form of organization prevails to varying degrees, the Interstate Commerce Commission could have new powers. The author concludes that the only course of action to arrest disinvestment in railroad properties is to create an environment that will permit the earning of profits obtainable on investments in other sectors of the economy.

Richardson, LK (Richardson Associates) *Railway Age* Vol. 178 No. 12, June 1977, 4 pp, 1 Tab.

ORDER FROM: ESL

DOTL JC

24 158195

**INITIAL PAPER OF THE RAIL SERVICES PLANNING OFFICE IN THE STUDY OF RAIL MERGERS AND CONSOLIDATIONS**

Under the 3R and 4R Acts, the RSPO merger study has four main objectives: (1) to identify the issues involved in rail mergers; (2) to provide a public forum for discussion of the these issues; (3) to develop public policy criteria for assessing individual merger proposals and to recommend legislative and regulatory changes as may be necessary to advance the public interest. The chapters in this publication: Study Objectives and Approach; Industry's Financial Posture; The Impact of Recent Legislation on Mergers; Commission's Approach to Mergers; Major Merger Issues.

Interstate Commerce Commission Merger White Paper, Apr. 1977, 92 pp, 8 Tab.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, 1900 L Street, NW, Washington, D.C., 20036

DOTL RP

25 072715

**NATIONAL TRANSPORTATION POLICY: THE NEED FOR A CLEAR CONCEPT**

The author attempts to identify transportation policy, noting that the existing policy might better be identified as de facto rather than defined since it represents a set of ad hoc compromises forged by many opposing forces in the public, social and economic areas. Another aspect of national policy concerns not what the Federal government is doing, but what it ought to be doing. Unless the U.S. decides on a "policy about policy" major elements of national transportation planning will continue to be formulated on an ad hoc basis with no notion of the basic considerations that need to be addressed.

This paper is from Transportation in Focus, Proceedings of the Fifteenth Annual Meeting of the Transportation Research Forum, San Francisco, California, 10-12 October 1974.

Till, TA (Department of Transportation)  
Cross (Richard B) Company Proc Paper Vol. 15 No. 1, 1974, pp.18-22, 2 Fig., 5 Refs.

ACKNOWLEDGMENT: Transportation Research Forum  
ORDER FROM: Vietsch (Grant C), 181 East Lake Shore Drive, Chicago, Illinois, 60611

DOTL RP

25 096987

**PRICING INVESTMENT DECISIONS AND SUBSIDIES IN TRANSPORT**

This paper argues against transport subsidies, and suggests a policy, based on a modified form of long-run marginal cost pricing, that would enable transport undertakings to break even. Previous debate is summarized, which concluded that price should equal short-run marginal cost, and gave criteria for investment. The problems of indivisibilities and peak loading modify these rules, which were derived for electricity generation. The author discusses ways in which transport differs from other undertakings, including diversity, indivisibilities, joint costs, externalities, policy constraints, and the short-run marginal cost curve. Three arguments for subsidies are presented. Transport can be viewed as a public good, whose investment costs cannot be allocated. Or transport can be seen to produce increasing returns. Thirdly, one can hope that a reduction in price, by attracting motorists, can create a net benefit for public transport. The author refutes all these, and adds that subsidies make optimal investment difficult. Finally, the author argues that fares should cover the marginal cost of a new unit of investment, which may, however, in transport be quite divisible. Road pricing and investment in roads are needed, not subsidized public transport. /TRRL/

Morgan, EV  
Manchester University, England Sept. 1974, pp 240-258, 2 Fig., 22 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 212255)  
ORDER FROM: Manchester University, England, Department of Economics, Manchester, England

25 137571

**THE OPINIONS OF TRADE AND INDUSTRY ON THE TRAFFIC POLICY REPORT "TRAFFIC POLICY-NEEDS AND POSSIBILITIES" (SOU 1975:66) [Hur Naeringslivet ser paa Trafikpolitiska Utredningen Naeringslivets Trafikdelegation;S (NTD) Remissvar paa Betaenkandet "Trafikpolitik-Behov och Moejligheter" (SOU 1975:66)]**

The former dominant position of the railways as goods carrier has been taken over by lorry traffic, the chief reasons being the great flexibility and availability of the latter. Swedish rail must be enabled to compete with other transport modes. Better facilities must be created for collaboration between modes; however, the gains in cost and service achieved in this way must be passed on to the consumers. SR must be compensated for keeping open uneconomic lines for social purposes. It is impossible to specify the size and structure of a haulage firm. In conjunction with licensing hauliers, the necessity to prove demand should be abolished, as well as capacity limitations. The criteria to be met regarding personal suitability should be defined better. Present legislation deals generally with all lorry traffic, and specifically with haulier traffic. Since the introduction of fines for infringement of weight etc regulations, offences have decreased. It is proposed that maximum length be cut from 24M to 18M; it is claimed that this will divert certain traffic to rail, but it is not proved that this is desirable on national

economic grounds. The effect would be to raise transport charges. A new central traffic planning council is proposed. /TRRL/ [Swedish]

Naeringslivets Trafikdelegation 1975, 25 pp

ACKNOWLEDGMENT: National Swedish Road & Traffic Research Institute, TRRL (IRRD-218407)  
ORDER FROM: Naeringslivets Trafikdelegation, Stockholm, Sweden

25 141126

**NATIONAL TRANSPORTATION POLICY STUDY: A SURVEY OF RAIL PASSENGER TRANSPORTATION**

This study is designed to provide data relevant to the Rail Passenger sector for an intermodal National Transportation Policy Study. The current state of technology in the Canadian rail passenger sector is described against a background of current and emerging technology on a worldwide basis. This review includes rolling stock, right-of-way, communications and control, terminals, procedures and regulations. A quantitative and qualitative assessment of the current performance of the sector is presented and includes the development of a hypothetical cost model to be used for the analysis of various technological alternatives delineated in subsequent sections. The third section briefly summarizes the expectations for technological change within the sector during the period 1975/1990 in terms of several alternative courses of action. The final section utilizes the previously developed hypothetical cost model to analyze a number of technological alternatives for the sector. Brief qualitative statements are made concerning the impact of potential technological change. The viability of a railway passenger system can only be considered on a route-specific basis, a procedure far beyond the scope of this study. Accordingly, questions are considered on a general or "type case" basis, in the hope that this will provide some generally useful information, or at least a framework for the consideration of specific problems.

This study was prepared for the Transportation Development Agency, Canadian Ministry of Transport.

Ganton, TD Macdonald, JA Lake, RW Law, CE Rice,  
RA Bliemel, F Schwier, C Bazuk, RN Roney, MD  
Canadian Institute of Guided Ground Transport, (CIGGT Project N.8.40)  
R&D Rpt. CIGGT Rept. N.75-3, Mar. 1975, 293 pp, Figs., Tabs., Photos., 75 Ref., 5 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

25 143926

**EVALUATING REVENUE SOURCES FOR PUBLIC TRANSIT: A NEW FRONTIER FOR ENVIRONMENTAL PLANNERS**

The report identifies alternative sources of revenue for the support of public transportation and suggests a comprehensive framework within which these alternative revenue sources may be evaluated. Particular attention is devoted to those sources of revenue (gasoline taxes, parking surcharges, congestion tolls, etc.) which positively impact on regional environmental and transportation planning objectives at the same time that they provide new revenue for transit support. The report draws on a limited number of existing studies to identify (1) the potential range of future revenue deficits facing U.S. transit operations; (2) the sources, amounts, and distribution of existing revenues going to support transit in the largest U.S. metropolitan areas; (3) alternative financing mechanisms available; (4) evaluation criteria which have previously been employed to select revenue sources for transit support; and (5) new criteria which could be employed to provide a more complete evaluation.

Shinn, R Conn, WD  
California University, Los Angeles, Urban Mass Transportation  
Administration, (UMTA-CA-11-0009) Res. Rpt. CAL-UT(7)-T-39,  
UMTA-CA-11-0009-75-5, Oct. 1975, 40 pp

Contract CA-11-0009

ACKNOWLEDGMENT: NTIS, UMTA  
ORDER FROM: NTIS

PB-256225/4ST, DOTL NTIS

25 143930

**THE EVOLUTION OF INTEGRATED TRANSIT-THREE PARABLES**

In the past decade, a desire for expanded urban public transportation has been generated by increased environmental and energy awareness, and by the negative impact of extensive freeway construction in the nation's major cities. More recently, increasing transit operating deficits have kindled interest in the more efficient use of existing transportation facilities and in finding more cost-effective means of improving and expanding public transit service. Restructured conventional and para-transit services, operated as a comprehensive regional transit system integrated operationally, physically, and institutionally, offer a promising solution. This study examines the implications of embarking on a ten-year strategy to implement such a system. Three levels of ridership response are assumed which affect system scale and operating policy decisions at biennial intervals. The operating cost and deficit implications of these three response parables are then traced, yielding insight into the feasibility of an evolutionary strategy.

Sobel, KL Batchelder, JH  
Multisystems, Incorporated, Office of Systems Development and Technology Final Rpt. DOT/TST-76T/4, June 1976, 38 pp

Contract DOT-OS-50266

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257160/2ST, DOTL NTIS

25 145535

**URBAN TRANSPORTATION DECISION MAKING: 9. TORONTO. 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 Toronto, Canada. See also PB-258000.

Colcord, FC Lewis, RS  
Tufts University, Office of Policy, Plans and International Affairs Final Rpt. OST-TPI-76-02-07, Mar. 1974, 122 pp

Contract DOT-OS-30036

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-257999/3ST, DOTL NTIS

25 146489

**TRANSPORTATION TECHNICAL ASSISTANCE NEEDS AND REQUIREMENTS ANALYSIS**

As part of the continuing reevaluation of the priorities of transportation decision-makers, the Office of R and D Policy (OST) has undertaken a study to determine the transportation technical assistance needs of the various user groups in the infrastructure. This determination was based on four independent studies: (1) TSC Technology Sharing surveys, (2) the report of the OMB Study Committee on Policy Management Assistance, (3) Urban Consortium for Technology Initiatives needs determination, and (4) the National Conference of State Legislatures survey. The analysis of these needs determinations was stratified to identify those needs peculiar to each of three user groups: (1) policy, (2) planning and evaluation, and (3) operations. The relationship of the needs to both the public management processes and Federal transportation policy are presented.

Albin, PA DiLuzio, RG  
Dynatrend, Incorporated, Department of Transportation Final rpt. DYN-UR-003, DOT/TST-76T-14, Sept. 1976, 37 pp

Contract DOT-OS-60500

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-259680/7ST, DOTL NTIS

25 148595

**RAIL PLANNING MANUAL. VOLUME I: GUIDE FOR DECISION-MAKERS**

This document is specifically written to assist policy-level decision-makers to (1) assess potential of rail problems in the State (2) ascertain roles of key participants in possible solutions (3) define roles for State and local government (4) estimate level-of-effort required in State rail planning; and (5) view the so-called 'situation' in proper context of industry, users, Federal and local areas of concern. With these readers in mind, this volume is divided in four parts, each of which can be reviewed independently. Chapter I gives a broad overview of today's problems in the railroad industry, and resulting issues facing State and local governments. Recent Federal legislation addressing these problems is also described. Chapter II gives a range of alternative State policy responses in the problem areas of light density lines and mainlines. Chapter III describes comprehensively how states become eligible to participate in Federally-assisted local rail service continuation programs. Finally, Chapter IV provides the coordinator of the State Rail Planning program with guidance for getting a program under way. A succeeding Volume III, planned for publication by September 30, 1977, will be developed to assist the planner-technician in detailed state rail planning procedures after the policy-level decision-makers have identified the State's level of interest.

Volume I includes a separate, three-section Preliminary Bibliography intended as a supplement to Volume II, Guide for Planners. This work was sponsored by the FRA, Office of State Rail Programs. Oversight and Project Managers, respectively, are: Garold R. Thomas (202-426-1567) and Norbert Y. Zucker (202-426-1568).

JWK International Corporation, Creighton (Roger) Associates, Incorporated, (JWK-76-205) Res. Rpt. FRA-RFA-76-06, Dec. 1976, 56 pp, 14 Fig., 1 Tab., 1 App.

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263182/8ST, DOTL NTIS, DOTL RP

25 148813

**COMPILATION OF CERTAIN RAILROAD LAWS WITHIN THE JURISDICTION OF THE HOUSE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE**

Includes: Regional rail reorganization act of 1973, Railroad revitalization and regulatory reform act of 1976, Part I of the Interstate commerce act; prepared for the use of the House Committee on Interstate and Foreign Commerce, July 1975.

United States House of Representatives Cong. Rpt. Y 4.In 8/4:R 13/73, 1976, 346 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications (76-7250)  
ORDER FROM: GPO

DOTL

25 149178

**COMMON CARRIER SYSTEM IN A MODERN ECONOMY: RESEARCH PROBLEMS**

The common carrier system of the United States has been based on factors and information of the 1930s and 1940s when the Federal Coordinator, the Transportation Act of 1940, and the Board of Investigation and Research were prominent. Although provisional, the resources and enactments of this era have been used for 3 decades as the basis for policy and administration. Therefore, a new intellectual movement if necessary to realize the full potentials of the common carrier concept, formulate the design of a regulatory or policy system, and develop the demand and supply capabilities of a modern transportation system. Research hypotheses should be derived from a basic economic appraisal of demand and supply under current conditions. From such should follow legal research on the nature of obligation necessary to realize an extended common carrier system and the elements of a logistical system needed to redefine transportation demand or product lines, and to provide the basis for improved performance in the supply systems consistent with a modernization of the common carrier concept and the modern product line concepts consistent with logistical science. Such research should be institutionalized through the legislated creation of an official study organization so that both objective and authoritative attention can be given to leading transportation issues. /Author/

Nupp, B (Department of Transportation) *Transportation Research Record* No. 591, 1976, pp 1-6, 2 Fig., 18 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

25 149423

**THE RAILWAYS' ROLE AND PROSPECTS IN THE PRESENT AND FUTURE TRANSPORT MARKET [Role et perspectives du chemin de fer sur le marche des transports actuel et futur]**

The author describes the Swiss transport system from the standpoint of: means of transport, ground area used, energy consumption. He discusses the CFF's situation as regards the economic crisis, and refers to the task assigned by the Federal Council in 1972 to the "Federal Commission for a Comprehensive Swiss Transport Concept", which was to prepare a proposal for the end of 1976 for a transport system to meet the objectives specified. [French]

Brocard, A *Bulletin Technique de la Suisse Romande* May 1976, pp 3-6, 4 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

25 149433

**DEVELOPING AN INSTRUMENT TO DETERMINE AND ASSESS THE INFLUENCE OF A POLICY OF STATUTORY MEASURES. PART 1: CONTAINERISABLE FREIGHT FLOWS [Aufbau eines Instrumentariums zur Ermittlung und Bewertung des Einflusses ordnungspolitischer Massnahmen. Stufe 1. Containerisierbare Gueterstroeme]**

A summary of a 407-page 2-volume survey ordered by the German Federal Minister of Transport. Its purpose is to use a simulation and decision-making model to investigate the effects of a policy of statutory measures on transport distribution in freight traffic, dealing only with containerisable freight. The considerations center on 7 statutory measures involving a price policy (increase in taxes, and reduction of differential prices in railway traffic). The analysis shows that such a policy of statutory measures only results in a relatively small transfer of traffic to the railway. [German]

*Internationales Verkehrswesen* Vol. 28 No. 5, Sept. 1976, pp 255-257

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Dr Arthur Tetzlaff-Verlag, Niddastrasse 64, Frankfurt am Main, West Germany

25 149434

**COORDINATION OF TRANSPORT INFRASTRUCTURE INVESTMENTS IN THE GERMAN FEDERAL REPUBLIC IN THE YEARS 1976 TO 1985 [Koordination der Verkehrsweginvestitionen des Bundes in den Jahren 1976-1985]**

In this article, the first in a series, the authors, members of the German Federal Ministry of Transport, give an account of the present state of investment coordination in the Federal Republic as regards transport infrastructure. [German]

Arnold, B *Internationales Verkehrswesen* Vol. 28 No. 5, Sept. 1976, pp 259-268, 3 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Dr Arthur Tetzlaff-Verlag, Niddastrasse 64, Frankfurt am Main, West Germany

25 149448

**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, 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 (Tennessee University, Knoxville) *Transportation (Netherlands)* Vol. 5 No. 2, June 1976, pp 123-133, 2 Fig., 9 Ref.

ACKNOWLEDGMENT: Transportation (Netherlands)

ORDER FROM: ESL

DOTL JC

25 149874

**THE RATIONALE OF PUBLIC TRANSPORT**

In 1972 public-transport subsidies by local authorities totalled 13 million English pounds; in 1974-75 they were estimated at 102 million. It was first announced in 1974 that the 1978-79 subsidy would be reduced to 50 million (at November 1973 prices) and in September 1975 further reductions were notified to county councils. The author discusses the influence that subsidies can have both on public transport facilities provided, the use of such facilities in relation to mobility and land use planning objectives, and the need that will arise for county councils to work towards the integration of their transport policies and programmes (tpps) into the structure plan, whereby consistency can be achieved between objectives for both planning strategy and transport policy. The implications behind the reductions in subsidies are discussed in the context of the link that is considered to exist between such subsidies and planning objectives which can be effected through public transport policy objectives. A summary of the arguments is: (1) subsidies should lead to increased use of public transport by allowing the operation of a better and/or cheaper service than would be the case on commercial grounds; (2) increased use of public transport can, in certain circumstances, lead to increased efficiency in resource allocation in the transport sector by obtaining a given level of benefits at a lower resource cost; (3) an improved level of public transport provision can result in increased mobility for certain members of the community; (4) both (2) and (3) can influence location decisions and affect land use planning policies. This article is presented as an attempt to offer guidance on which county councils can formulate policies and determine rationales for their subsidy policies. /TRRL/

Tyson, WJ *Town Planning Review* Vol. 47 N4, 7610, pp 315-324, 17 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 224147)

ORDER FROM: Liverpool University Press, 123 Grove Street, Liverpool, England

25 149911

**IMPROVED CONTROLS NEEDED OVER FEDERAL FINANCIAL ASSISTANCE TO RAILROADS**

Before 1976 direct Federal assistance to U.S. railroads was in response to specific crises in the Midwest and Northeast regions with more than \$825 million provided in loans, loan guarantees and grants. Available Federal assistance increased dramatically with passage of the Railroad Revitalization and Regulatory Reform Act of 1976 which authorized about \$1.6 billion in direct assistance available nationwide. Administrative and auditing procedures of assistance to date have been examined with numerous recommendations on pre-award procedures, accounting and monitoring of future grants. While it did not find any indication that railroads used Federal funds for purposes other than intended by legislation, it did question the timing of such usage in the light of other working capital. GAO agrees that the goal of continuing essential rail services was met, but stated that FRA monitoring did not assure that this was achieved at lowest possible cost to the Government.

The report consists of GAO recommendations to FRA/DOT and the United States Railway Association.

General Accounting Office CED-76-161, Nov. 1976, 58 pp, 3 App.

ACKNOWLEDGMENT: General Accounting Office

ORDER FROM: General Accounting Office, Distribution Section, Room 4522, 441 G Street, NW, Washington, D.C., 20548

DOTL

25 149948

**THE ROLE OF TRANSIT OPERATING AGENCIES**

By 1973, over 100,000 people were commuting daily into metro Toronto. Rush-hour congestion was no longer a purely local problem that could be solved by one region acting alone. It was realized that the needs of the commuter cannot be met without the co-operation and co-ordination of all

transit properties in an urban area. This paper describes the formation of the Transit Operating Authority for the Toronto area, the first attempt by the province of Ontario to establish an appropriate agency to carry out the functions necessary to achieve an integrated network of transit operations. /TRRL/

Proceedings of the RTAC Annual Conference, 1975, held in Calgary, Alberta.

Howard, WT (Toronto Area Transit Operating Authority)  
Roads and Transportation Association of Canada Proceeding 1976, pp 205-217, 2 Fig.

ACKNOWLEDGMENT: Roads and Transportation Association of Canada (RTAC02205E), TRRL (IRRD 223789)

ORDER FROM: Roads and Transportation Association of Canada, 1765 St Laurent Boulevard, Ottawa, Ontario K1G 3V4, Canada

25 150409

#### GOVERNMENT TRANSPORT POLICY AND TECHNOLOGICAL PROGRESS

Along with regulation, government involvement in advancement of transportation technology involves direct investment, promotion, subsidy, technological spinoff, taxation and welfare. Two facets of technology are involved: the rate at which new technology is developed and the rate at which it is applied in industries to which it is applicable. The most direct effects upon transport technology may be those which stem from governmental influences upon availability of funding. Two examples are examined: The stagnation of rail development through inadequate capital flow, and the near demise of public urban transportation in consequence of the multiplication of funding for highway purposes and its substantial denial for other transport modes. Both reflect a readiness to enlarge commitments within the sphere of governmental control and to ignore the effects of that policy upon the private sector or upon concerns of presumed local character. There was little foresight in appraising the likely consequences. Regulatory reform is also required, but not complete deregulation.

Presented at the Annual Meeting of the American Society of Traffic and Transportation, Inc., in New York City, August 1976.

Williams, EW, Jr (Columbia University, New York) *Transportation Journal* Conf Paper Vol. 16 No. 2, Dec. 1976, pp 86-91

ORDER FROM: ESL

DOTL JC

25 150410

#### THE ECONOMIC EFFECTS OF TRANSPORT DEREGULATION IN AUSTRALIA

Australia is a country comparable to the U.S. in many ways, although its principal railroads are under government ownership. Australian regulation had been far more protective of the railways than U.S. regulation, but starting in 1954 for interstate commerce, and after 1963 for certain intrastate transport, this concept has been abandoned or relaxed. Specific experiences in interstate and intrastate competition are described. The author concludes that Australian experience should not discourage Congress from deregulating surface modes. The U.S. dependence on value-of-service rate structures would decrease; railway services and plant would be rationalized, or losing services be supported for social-service ends, by federal or other government agencies; long-term solutions to the railroad "problem" would be expedited. Unresolved in Australia is whether highway trucking pays fully for public costs of highway services demanded and used, and for the differential social costs occasioned. Deregulation should promote real movement toward efficient allocation of traffic and resources in surface transport.

Nelson, JC (Washington State University) *Transportation Journal* Vol. 16 No. 2, Dec. 1976, pp 48-71, 54 Ref.

ORDER FROM: ESL

DOTL JC

25 150758

#### IMPEDIMENTS TO THE IMPLEMENTATION OF DESIRABLE CHANGES IN THE REGULATION OF URBAN PUBLIC TRANSPORTATION

Economic and sociological aspects of transportation regulations are discussed. Impediments to change in regulations are considered to be legal, moral and intellectual in nature. Problems of deregulation, subsidizing and

compensation involved in changes in regulation of urban public transportation are discussed.

Feldman, P

Public Research Institute Paper PRI-PP-166, Oct. 1976, 16 pp

ACKNOWLEDGMENT: NTIS

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AD-A033322/9ST, DOTL NTIS

25 152398

#### CRITERIA FOR THE RATIONAL DISTRIBUTION OF COMMITMENTS BETWEEN THE DIFFERENT MODES OF TRANSPORT

This article describes the various criteria for the rational distribution of transport commitments and the factors which decide the choice of the mode of transport. The authors also analyse the economic and restrictive criteria and propose a synthesis parameter for these criteria, enabling the most advantageous mode of transport to be chosen for the community as a whole.

Calugaru, D *Rail International* Vol. 7 No. 12, Dec. 1976, pp 668-672

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

25 152654

#### THE ECONOMICS OF UPGRADING SEVENTY-ONE BRANCH RAIL LINES IN IOWA

Proposed abandonment of branch lines in rural areas has stimulated concern over the impact on shippers, receivers and rural communities. This paper presents estimates of the benefits and the costs of upgrading 71 branch lines. The benefit-cost analysis is used to compare the net benefits with net costs of upgrading the lines. Separate models are utilized to estimate the benefits to grain shippers, fertilizer shippers, and the shippers and receivers of all other products, from the upgrading. Benefit-cost ratios are presented for six alternative solutions.

This article is also available as Journal Paper No. J-8476 (Project No. 2016) of the Iowa Agricultural and Home Economics Experiment Station, Iowa State University, Ames, 50010. See also article on 4R Act's local rail assistance by authors in *Logistics and Transportation Review*, V12 N5, RRIIS 25 152674 7702.

Baumel, CP Miller, JJ Drinka, TP (Iowa State University, Ames) *American Journal of Agricultural Economics* Reprint Vol. 59 No. 1, Feb. 1977, pp 61-70, 2 Fig., 2 Tab., 10 Ref.

ACKNOWLEDGMENT: American Journal of Agricultural Economics

ORDER FROM: American Agricultural Economics Association, Department of Agricultural Economics, Kentucky University, Lexington, Kentucky, 40506

25 152661

#### ILLINOIS RAIL SYSTEM PLAN--PHASE 2

This State Rail Plan is the qualification of the State of Illinois for Section 402 of the Regional Rail Reorganization Act of 1973 for funds to continue local rail services on Penn Central lines that would otherwise be abandoned. The objectives are minimizing of the adverse impacts of changes in the transportation system and maintenance of an adequate, balanced transportation system to serve the State. Of 280.5 miles of PC trackage not recommended for inclusion in Conrail, 39.6 miles were out of service and not eligible for subsidy. The remaining 240.9 miles are recommended for sale to solvent railroads or for service-continuation subsidies.

Illinois Department of Transportation Plan Rpt. Dec. 1975, 58 pp, Figs., Tabs., 4 App.

ACKNOWLEDGMENT: Illinois Department of Transportation

ORDER FROM: Illinois Department of Transportation, 126 East Ash Street, Springfield, Illinois, 60616

25 152674

#### IMPLICATION OF THE LOCAL RAIL ASSISTANCE SECTION

The local rail service continuation program under the Railroad Revitalization and Regulatory Reform Act of 1976 does not promote improvement of the efficiency of local rail service because funds are prevented from being

used to upgrade lines with potential benefit-cost ratios greater than 1.0. If such lines are permitted to deteriorate and if lines with ratios under 1.0 are subsidized but not upgraded, grain will tend to bypass both types of lines. Section 803 funds could be more effectively expended if the law were revised to provide for upgrading of marginal lines to increase the efficiency of local rail service, encourage adjustments in product flows and shipping facilities, and result in improved allocation of funds for rural freight transportation.

This paper was awarded first prize by the Review's editors in a competition dealing with railroads and rail problems. See also article on economics of upgrading branchlines by the authors in the *American Journal of Agricultural Economics*, Vol. 59, No. 1 (Feb. '72), RRIS 25 152654 7702.

Baumel, CP Drinka, TP Miller, JJ (Iowa State University, Ames)  
*Logistics and Transportation Review* Vol. 12 No. 5, 1976, pp 293-308, 1 Fig., 5 Tab., 12 Ref.

ORDER FROM: Logistics and Transportation Review, Faculty of Commerce, British Columbia University, Vancouver V6T 1W5, British Columbia, Canada

25 152675

**PURCHASE AND REVITALIZATION OF NORTHEAST CORRIDOR PROPERTIES (AMTRAK): HEARING BEFORE THE COMMITTEE ON APPROPRIATIONS, BUDGET, AND COMMERCE, UNITED STATES SENATE**  
No Abstract.

United States Senate Cong. Rpt. 1976, 64 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO  
ORDER FROM: GPO

Y 4.AP6/2:N 81

25 152682

**THE NEW JERSEY PLAN FOR RAIL TRANSPORTATION AND LOCAL RAIL SERVICES. PHASE I**

This planning document was submitted to the Federal Railroad Administration to describe the procedures to be followed in making the detailed evaluations of the effects of discontinuing service on the 193.8 miles of rail lines excluded from the Conrail system. The effects to be evaluated include environmental impacts, community impacts, growth potential and relationships with the overall rail network in the State of New Jersey. The aim also is to appraise freight movements in the state as part of a much broader planning effort. The State Rail Plan is required under mandates of the Regional Rail Reorganization Act of 1973.

New Jersey Department of Transportation Plan. Rpt. May 1975, 40 pp, 2 Fig., 2 App.

ACKNOWLEDGMENT: New Jersey Department of Transportation  
ORDER FROM: New Jersey Department of Transportation, 1035 Parkway Avenue, Trenton, New Jersey, 08625

25 152683

**NEW JERSEY STATE RAIL PLAN... FOR RAIL TRANSPORTATION AND LOCAL RAIL SERVICES**

This Phase II of the State Rail Plan, submitted to the Federal Railroad Administration, presents detailed analyses and results of the evaluations made for each segment of the 193.8 miles of rail lines not to be included in the Conrail system. Recommendations are presented which suggest possible methods for continuing service or for alternative disposition of excess rail rights of way. For each segment the statewide significance, its value as part of existing operations, and operational alternatives for continuing service are examined. Desirable alternatives for each consider state fiscal policy, local rail user desires and the most economical option available.

New Jersey Department of Transportation Plan. Rpt. Dec. 1975, 260 pp, 8 Fig., 21 Tab., Refs., 4 App.

ACKNOWLEDGMENT: New Jersey Department of Transportation  
ORDER FROM: New Jersey Department of Transportation, 1035 Parkway Avenue, Trenton, New Jersey, 08625

25 153062

**GOVERNMENT INTERFERENCE HOLDS DANGERS FOR RAIL SHIPPERS**

Major challenges face Canadian railways in 1977; foremost among these are recent federal government proposals for changes in the National Transportation Act of 1967 which would formalize the "user pay" principle and which would reintroduce federal control over freight rates. The author examines the reasoning behind these proposals and their possible implications. The major railways are opposed to federal freight rate controls, arguing that it will result in higher rates and loss of business. The findings of recent inquiry commissions (Snively Commission and the Hall Commission) into grain handling costs and transportation are also examined.

See Volume 1 of the Snively Commission report, RRIS 18 152671 7702.

Guerra, A *Canadian Transportation & Distribution Management* Vol. 80 No. 3, Mar. 1977, pp 26-32, 3 Phot.

ACKNOWLEDGMENT: CNR

ORDER FROM: Southam Business Publications Limited, 1450 Don Mills Road, Don Mills, Ontario M3B 3J4, Canada

DOTL JC

25 153365

**DOT GROUND TRANSPORTATION R&D PROGRAMS: REPORT**  
No Abstract.

Prepared by the Subcommittee on Aviation and Transportation R&D of the U.S. House Committee on Science and Technology.

United States House of Representatives Cong. Rpt. No. 94-RR, Nov. 1976, 26 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: GPO

Y 4.Sci 2:94-2/RR

25 153371

**TECHNIQUES OF TRANSPORT PLANNING**

Contents: 1) The transport planning problem; 2) Basic analogy: planning problems of the multiproduct firm; 3) Theory and practice of transport network planning with particular reference to intercity road networks.

Prepared by the U.N.'s Economic and Social Commission for Asia and the Pacific (ESCAP) Secretariat, Bangkok, Thailand.

Jansson, OJ (Stockholm School of Economics, Sweden) *Transport & Communications Bull for Asia & Pacific* No. 50, Sept. 1976, pp 1-7, 4 Ref.

ACKNOWLEDGMENT: United Nations

ORDER FROM: United Nations Publications, Sales Section, United Nations Plaza, New York, New York, 10017

E.76.II.F.16

25 153375

**FAILINGS IN U.K. TRANSPORT PLANNING**

This discussion of British Government policy on transport, highlights the absence of a coherent strategic plan as a guideline for individual decision-making. Without this framework and a recognition of the close connection between transport and land use planning, conventional methods of project appraisal produce an unsatisfactory piecemeal transport system. As an example, the 1973 Channel Tunnel proposals are examined and found inappropriate for either of the main possible directions of progress sketched out.

Joliffe, JK (Lancaster University, England) *Long Range Planning* Vol. 10 No. 1, Feb. 1977, pp 73-78, 12 Ref.

ACKNOWLEDGMENT: Long Range Planning

ORDER FROM: ESL

DOTL JC

25 153379

**IDENTIFICATION AND OPTIMIZATION OF ALTERNATIVE RE-USES FOR PROPOSED RAILROAD ABANDONMENT RIGHT-OF-WAY**

With the apparent large scale abandonment of railway right-of-way, both past and projected for the near future, there is a need for state governments to initiate a review process whereby alternative uses for the abandoned

right-of-way are considered before the land is allowed to be sold (on the open market). Other studies have identified the necessary legislation and methodology for implementing such a review process. It is the purpose of this paper to identify a specific methodology for analysis of alternative re-uses. It contains a review of some of the potential re-uses, identification of possible benefits and costs for the various re-use selections, and a methodology involving integer linear programming.

Sponsored by U.S. DOT's Office of University Research.

Bair, BO Meyer, MC Tweedale, C  
Iowa University Tech. Rpt. No. 41, Mar. 1975, 42 pp, 4 Fig., 8 Tab., 11 Ref., 1 App.

DOT-OS-400 19 TOTAL FUNDS:

ACKNOWLEDGMENT: DOT  
ORDER FROM: Iowa University, Institute of Urban and Regional Research,  
102 Church Street, Iowa City, Iowa, 52242

DOTL RP

**25 153383**  
**CONSTRUCTION AND OPENING OF THE MODERN RAILWAY LINE FROM BELGRADE TO BAR IN YUGOSLAVIA**  
After a brief historical introduction, this article describes the railway line linking Belgrade to Bar, on the Adriatic coast, which was officially opened to traffic on 30th May, 1976. Characteristic for this line through mountainous country are the numerous bridges and tunnels on this 476 km single track line, which is electrified with 24 kV 50 Hz current. This line constitutes an artery of the Yugoslav Railways of enormous economical importance, not only in internal traffic, but even more so for international traffic. During the first stage, this link will carry 10 million passengers per year, and approximately 5 million tonnes of goods.

Filipovic, M *Rail International* Vol. 7 No. 12, Dec. 1976, pp 662-667

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**25 153384**  
**SPAIN CATCHES UP WITH WESTERN EUROPE AS TRAFFIC AND INVESTMENT RISE**  
RENFE is engaged on the most ambitious electrification programme in Western Europe as well as speeding heavily on renewal of track and rolling-stock. Current objectives are to increase rail's share of freight tonne/km from 25 to 30 percent and achieve a 4.5 percent annual rise in passenger traffic. Railway Gazette's Editor Richard Hope asked Director-General Antonio Carbonell to explain how this is to be achieved while meeting government pressure to carry freight and inter-city passengers on a commercial basis.

Carbonell, A *Railway Gazette International* Vol. 133 No. 2, Feb. 1977, pp 49-53

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

**25 153408**  
**THE ADVANCED PASSENGER TRAIN**  
With construction of the three prototype Advanced Passenger Trains for trial service on the West Coast main line well advanced, several papers have been published on the new equipment. This description draws on a number of sources including BR's first technical release about the train.

*Modern Railways* Vol. 34 No. 341, Feb. 1977, pp 56-62

ACKNOWLEDGMENT: British Railways  
ORDER FROM: Allan (Ian) Limited, Terminal House, Shepperton TW17 8AS, Middlesex, England

DOTL JC

**25 153992**  
**UTILIZATION AND FREIGHT RATE POLICY**  
The traditional role of the shipper and the carrier has changed over the years to a marked degree, and of necessity varies from commodity market to commodity market. However, the role of carrier and shipper as institutional-

ized by the Transportation Act of 1887 or Interstate Commerce Act has been that of adversaries. In 1973, Utah State University undertook a two year, federally funded study of current transportation practices to determine: (1) the historical basis of current practices and the economic interrelationships of these practices; and (2) a community program for effectively improving the role of the transportation community in the overall scheme of economic activity. This assembly of data follows the original project format completely, developing first the history of current practices and then evolving into the economics and interactions of the present structure. The final model for community action, developed subsequent to the completion of phase II has been reviewed by competent legal staff and provides a working base; however, local legal assistance should be sought if this plan is implemented by a shipper group.

Taylor, MH Baker, FJ  
Utah State University, Department of Transportation Final Rpt.  
DOT/TST-76T-27, Sept. 1976, 117 pp

Contract DOT-OS-30116

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264928/3ST, DOTL NTIS

**25 154048**  
**AN ANALYSIS OF THE FINANCIAL AND INSTITUTIONAL FRAMEWORK FOR URBAN TRANSPORTATION PLANNING AND INVESTMENT**  
The focus of the report is primarily on the Federal Government role in urban transportation planning and investment. The study and the organization of the report are designed to explore whether urban transportation planners and decision-makers operating at the local area level are limited by Federal legislation and administrative policies as to the urban transportation options they can realistically examine. It is assumed by the study team that a Federal Government policy that severely limits such options or favors a particular option is inappropriate except when it is clear that the national interest is at stake and priorities should be given to particular alternatives. The study indicates that the current institutional and financial framework does seriously constrain urban transportation planning and decision-making at the local area level and in general terms it has recommended that these constraints be removed where possible.

Wells, J Asher, NJ Brennan, RJ Crane, JR Kiernan, JD  
Institute for Defense Analyses, Office of Policy, Plans and International Affairs IDA/HQ-70-11286, DOT/TPI-10-77/06, June 1970, 124 pp

Grant DOT-UT-43

ACKNOWLEDGMENT: NTIS  
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PB-265245/1ST, DOTL NTIS

**25 154056**  
**INSTITUTIONAL FRAMEWORK FOR INTEGRATED TRANSPORTATION PLANNING. AN INFORMATION BULLETIN OF THE TRANSPORTATION TASK FORCE OF THE URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES**  
This is one of eight information bulletins developed for the Urban Consortium for Technology Initiatives' Transportation Task Force. The Consortium is a coalition of 34 major urban governments, 28 cities and 6 counties, with populations over 500,000. This bulletin covers mechanisms encouraging the consideration of highways and transit together in developing short and long range transportation plans and programs. Areas covered include regulatory issues associated with Unified Planning Work Programs, Transportation Plans, and Transportation Improvement Programs, as well as institutional issues associated with Metropolitan Planning Organizations. A extensive list of contacts, a description of ongoing research programs in this area and an annotated bibliography are also provided.  
See also PB-258 740.

French, BI Casebeer, EMC  
Public Technology, Incorporated, Department of Transportation Final Rpt. DOT/TST-77-4, Oct. 1976, 49 pp

Contract DOT-OS-60076

ACKNOWLEDGMENT: NTIS



ORDER FROM: NTIS

PB-275450/8ST, DOTL NTIS

**25 154594****METROPOLITAN FISCAL ANALYSIS. VOLUME 6: TECHNICAL REPORT: LOCAL-STATE-FEDERAL FISCAL FLOWS AND FUNCTIONS IN THE NATIONAL CAPITAL REGION (BASIS FOR VOLUME 5)**

The report addresses costs related to two public services in the Washington metropolitan area: Transportation--metrobus and metrorail, and social services. Costs and benefits are also analyzed for recreation and cultural opportunities, emergency health services, and fire mutual aid.

See also Volume 5, PB-262 685. Also available in set of 6 reports PC E13, PB-262 680-SET.

Verburg, EA O'Donnell, S Brown, J Spallino, S  
Metropolitan Washington Council of Governments, Department of  
Housing and Urban Development Tech. Rpt. Dec. 1975, 293 pp

Grant HUD-CPA-03-39-1017

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-262686/9ST, DOTL NTIS

**25 154595****METROPOLITAN FISCAL ANALYSIS. VOLUME 5: OVERVIEW: LOCAL-STATE-FEDERAL FISCAL FLOWS AND FUNCTIONS IN THE NATIONAL CAPITAL REGION**

The report summarizes a larger study which covers two major topics: local-state-federal fiscal flows in the Washington metropolitan area, and costs and benefits associated with non-resident use of local facilities and services. The first section of the report identifies the local-state-federal fiscal flows in the region and describes their concentrations, distributions, and comparative burdens. These fiscal flows are analyzed to determine how the region and its subdivisions are influenced by local-state-federal tax collections and outlays for local-serving facilities. Fiscal flows are compared with regard to local-state-federal sources and the three portions of the region. The second section of the report addresses costs related to two public services in the region: transportation--metrobus and metrorail, and social services. Costs and benefits are also analyzed for recreation and cultural opportunities, emergency health services, and fire mutual aid.

See also Volume 4, PB-262 684. Also available in set of 6 reports PC E13, PB-262 680-SET.

Verburg, EA  
Metropolitan Washington Council of Governments, Department of  
Housing and Urban Development Apr. 1975, 43 pp

Grant HUD-CPA-03-39-1017

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-262685/1ST, DOTL NTIS

**25 154843****AVAILABILITY AND USE OF ABANDONED RIGHTS OF WAY**

No Abstract.

Set includes PB-265 992 thru PB-265 997.

Harbridge House, Incorporated, Department of Transportation 6 vol-  
umes, Jan. 1977, 1512 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265991-SET/ST, DOTL NTIS

**25 154844****AVAILABILITY AND USE OF ABANDONED RIGHTS OF WAY. TASK 1. ALTERNATE USE SUITABILITY CRITERIA**

As a part of the study under Section 809 (a) (1) of the Railroad Revitalization and Regulatory Reform Act of 1976, an inventory of all railroad rights of way abandoned in the period 1970-1976 was developed. The Act required that all abandonments in the inventory be assessed for alternate use suitability. This task describes the alternate use suitability criteria and discusses the methodology that was used to determine suitable alternate uses for the inventoried abandonments. The methodology includes

a comprehensive list of suitable alternate uses that make use of and preserve the linear corridor of the right of way. Twenty-six alternate uses are categorized under conservation/open space, recreation, transportation and utilities. It includes also a physical assessment methodology which combines a ranking of alternate uses and a rating of four key physical suitability characteristics (length, width, land use, and topography) with a decision tree which lists the possible alternate uses for every combination of the four physical characteristics.

Also available in set of 6 reports PC E17, PB-265 991-SET.

Sieczkowski, S Krauss, J Bysshe, S  
Harbridge House, Incorporated, Department of Transportation Final Rpt.  
DOT/TES-77/001, Jan. 1977, 98 pp

Contract DOT-O2-60514

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265992/8ST, DOTL NTIS

**25 154845****AVAILABILITY AND USE OF ABANDONED RIGHTS OF WAY. TASK 2. INVENTORY OF ABANDONED RIGHTS OF WAY**

As a part of the study of the Railroad Revitalization and Regulatory Reform Act of 1976, an inventory was developed of all railroad rights of way abandoned in the period 1970-1976 which (1) are over 1.0 mile in length outside Standard Metropolitan Statistical Areas (SMSA's), or over .25 mile inside SMSA's; and (2) retain their linear character in terms of physical characteristics and ownership patterns. The inventory of abandonments includes the identification of the owner of record and an evaluation of the topography, characteristics, condition, approximate value and alternative use suitability. The possible alternate uses for the inventoried abandonments were determined by using the alternate use suitability criteria methodology developed under Task 1.

See also Task 1, PB-265 992. Also available in set of 6 reports PC E17, PB-265 991-SET.

Sieczkowski, S Krauss, J Bysshe, S  
Harbridge House, Incorporated, Department of Transportation Final Rpt.  
DOT/TES-77/002, Jan. 1977, 558 pp

Contract DOT-OS-60514

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265993/6ST, DOTL NTIS

**25 154846****AVAILABILITY AND USE OF ABANDONED RIGHTS OF WAY. TASK 3. THE RAIL BANKING CONCEPT**

The task evaluated the advantages of establishing a rail bank consisting of selected such rights of way, as a means of assuring their availability for potential railroad use in the future. The evaluation synthesizes the problems and issues at stake in rail banking through a five-part discussion: (1) The issue of whether to abandon or preserve railroad rights of way for future rail service; (2) the legislative dilemma; (3) the current situation--a lack of understanding and analysis; (4) the role of existing programs; (5) persistent problems--alternatives and recommendations.

See also Task 2, PB-265 993. Also available in set of 6 reports PC E17, PB-265 991-SET.

Marston, L Beresford, S Waldo, A  
Harbridge House, Incorporated, Department of Transportation Final Rpt.  
DOT/TES-77/003, Jan. 1977, 96 pp

Contract DOT-OS-60514

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265994/4ST, DOTL NTIS

**25 154847****AVAILABILITY AND USE OF ABANDONED RIGHTS OF WAY. TASK 4. A. SURVEY OF FEDERAL PROGRAMS. B. SURVEY OF STATE AND LOCAL PROGRAMS**

In accordance with requirements of the Railroad Revitalization and Regulatory Reform Act a survey was undertaken of existing Federal, State,

and local programs utilizing or attempting to utilize abandoned railroad rights of way for public purposes. The results of the survey describe and assess policies, programs, and legislation which have influenced the conversion of abandoned railroad rights of way to other public uses.

See also Task 3, PB-265 994. Also available in set of 6 reports PC E17, PB-265 991-SET.

O'Donahoe, G Franz-Goldman, C  
Harbridge House, Incorporated, Department of Transportation Final Rpt.  
DOT/TES-77/004, Jan. 1977, 295 pp

Contract DOT-OS-60514

ACKNOWLEDGMENT: NTIS  
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PB-265995/1ST, DOTL NTIS

25 154848

**AVAILABILITY AND USE OF ABANDONED RIGHTS OF WAY.  
TASK 4. C. CASE STUDIES OF RAILROAD ABANDONMENTS**

In accordance with requirements of the Railroad Revitalization and Regulatory Reform Act a survey and case studies were undertaken of programs utilizing or attempting to utilize abandoned railroad rights of way for public purposes. The results of the survey are described in Task 4 (A) (B). This Task discusses the case studies which explored the problems, solutions and benefits associated with right of way conversion.

See also Task 4, A and B, PB-265 995. Also available in set of 6 reports PC E17, PB-265 991-SET.

O'Donahoe, G Bowen, R  
Harbridge House, Incorporated, Department of Transportation Final Rpt.  
DOT/TES-77/005, Jan. 1977, 303 pp

Contract DOT-OS-60514

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265996/9ST, DOTL NTIS

25 154849

**AVAILABILITY AND USE OF ABANDONED RIGHTS OF WAY.  
TASK 5. PUBLIC USE OF ABANDONED RIGHTS OF WAY**

The task addresses Section 809 (a) (4) of Public Law 94-210. The Railroad Revitalization and Regulatory Reform Act of 1976 which calls for an assessment and evaluation of suggestions for more effective public utilization of abandoned railroad rights of way, including recommendations for legislative, administrative, and regulatory action, if any, and proposals as to the optimum level of funding therefor. The task focuses on three areas: ideas for public utilization, policy and program recommendations, and funding required for program implementation.

See also Task 4, C, PB-265 996. Also available in set of 6 reports PC E17, PB-265 991-SET.

Brandwein, R  
Harbridge House, Incorporated, Department of Transportation Final Rpt.  
DOT/TES-77/006, Jan. 1977, 162 pp

Contract DOT-OS-60514

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265997/7ST, DOTL NTIS

25 157219

**TENTH AND FINAL REPORT ON THE HIGH SPEED GROUND  
TRANSPORTATION ACT OF 1965**

This is the tenth and final report to the Congress on research, development, and demonstrations activities authorized by the HSGT Act of 1965. The activities are evaluated, accomplishments described, recommendations presented, and the history of the HSGT Program consolidated into one document. More than 400 reports were produced on railroad and advanced systems since the Act was signed in 1965. Major accomplishments of the program include: (a) creation of continuing Federal R&D in railroad technology, (b) establishment of the Transportation Test Center, (c) demonstration that quality rail passenger service will be used in this country, (d) system performance and cost estimates for the Northeast Corridor multi-modal regional transportation study, (e) development of data process-

ing of rail passenger statistics now used by Amtrak, (f) conception of Auto Train, (g) initiation of railroad track dynamics research (the first scientific investigation of track in over 30 years), (h) construction of the Rail Dynamics Laboratory, (i) Development of automated track geometry inspection, (j) advancement of linear electric motor technology, (k) expansion of knowledge of magnetic levitation, (l) analysis of the dynamics of air cushion levitation, and (m) exploration of the ram air cushion. DOT should continue to follow research on tracked levitated vehicles and other advanced technology as an option for high-density short-haul routes as future needs may develop for intercity passenger systems.

A report to the President and the Congress by the Secretary of Transportation.

Federal Railroad Administration Cong. Rpt. FRA/ORD-77/27, May 1977, 120 pp, 31 Fig., 17 Ref., 2 App.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-271508/AS, DOTL NTIS, DOTL RP

25 157220

**PROCEEDINGS OF THE REGIONAL RAIL PLANNING  
SEMINARS, FALL 1976**

This document is a compilation of papers, talks and presentations made at five seminars held in each of FRA's regions during Fall 1976. These seminars attracted close to 700 persons from State and Federal governments, rail management and labor, shippers, consultants and academia. The first four seminars were designed to educate those states eligible for Federal assistance under Section 803 of the Railroad Revitalization and Regulatory Reform Act of 1976 (P.L. 94-210) about this new program, and to inform them about other Federal rail planning activities under way in a number of agencies. Evening workshops for State rail planners were programmed to give registrants even more opportunity to question the Federal speakers in depth concerning practical details about the program. The last seminar, held in Albany, New York, was designed to examine the progress of the Title IV program of the Regional Rail Reorganization Act of 1973 (P.L. 93-236) and to project the future course of the rail service planning and assistance programs in the 17-State Northeast and Midwest Region. To accomplish this, panels of speakers examined the rail planning process in perspective of the experience in this Region, and regional railroad spokesmen discussed the impacts these programs have had on them. Federal spokesmen then provided information on several ongoing studies concerning national rail planning, and FRA and Amtrak representatives gave presentations on the Northeast Corridor Program.

Council of State Governments Res. Rpt. FRA-RFA-77-01, Apr. 1977, 165 pp, Figs., Tabs., Refs.

Contract DOT-FR-66060

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

25 157232

**MICHIGAN RAILROAD PLAN, PHASE I**

The Michigan Railroad Plan, Phase I, was prepared in compliance with the Regional Rail Reorganization Act of 1973 and includes input from railroads, shippers, labor, regional planners, local and State governments and individuals. The peninsular geography of the state is claimed to place special emphasis on railroads as links in social well-being of citizens. The publication explains Michigan's position on railroads, describes the responsibility of the Michigan Department of State Highways and Transportation, gives a perspective of Michigan railroad planning and public participation, and concludes with an explanation of the planning process.

Prepared by the Railroad Planning Section of the Bureau of Transportation Planning. Direct requests to Mr. T.J. Trimbach, Manager.

Michigan Department of State Highways & Transport May 1975, 36 pp, 2 Fig.

ACKNOWLEDGMENT: Michigan Department of State Highways & Transport  
ORDER FROM: Michigan Department of State Highways & Transport,  
Railroad Planning Section, P.O. Drawer K, Lansing, Michigan, 48904  
DOTL RP

25 157233

**MICHIGAN RAILROAD PLAN. PHASE II**

The Michigan Railroad Plan, Phase II, documents the decisions and priorities regarding Penn Central and Ann Arbor light density lines not included in the Conrail system. After describing policy, goals and planning methodology, material on 46 threatened branch lines is presented with respect to various potential impacts. Similar information is given on the Ann Arbor main line and Lake Michigan ferry services. The Plan for all these routes is then presented with the funding required under the Regional Rail Reorganization Act of 1973. The future planning needed to continue the process of railroad revitalization in Michigan concludes the volume.

Direct requests to Mr. T.J. Trimbach, Manager, Railroad Planning Section, Bureau of Transportation Planning.

Michigan Department of State Highways & Transport June 1976, 277 pp, 12 Fig., 14 Tab., Refs.

ACKNOWLEDGMENT: Kentucky Department of Transportation  
ORDER FROM: Michigan Department of State Highways & Transport, Railroad Planning Section, P.O. Drawer K, Lansing, Michigan, 48904  
DOTL RP

25 157234

**MICHIGAN RAILROAD PLAN. ANNUAL UPDATE**

Required under the Regional Rail Reorganization Act of 1973 is an annual update of the state rail plans on August 1 of each year. This is the first such report on the Michigan Railroad Plan: Phase II, issued in June 1976. The relatively short time during which the subsidy program had operated and the fact that no major changes had been indicated for the Plan as submitted meant that this was primarily a report on the implementation of the plan. It is a progress report and assessment of subsidized branch line operations.

Direct requests to Mr. T.J. Trimbach, Manager, Railroad Planning Section, Bureau of Transportation Planning.

Michigan Department of State Highways & Transport Aug. 1976, 50 pp, 1 Fig., 9 Tab.

ACKNOWLEDGMENT: Michigan Department of State Highways & Transport  
ORDER FROM: Michigan Department of State Highways & Transport, Railroad Planning Section, P.O. Drawer K, Lansing, Michigan, 48904

25 157236

**JAPAN'S URBAN TRANSPORTATION SYSTEM IN THE MAJOR TRANSPORT SPHERES**

The urban areas in Japan have undergone rapid changes in the last two and one-half decades. At the same time, the urban transportation system has been faced with numerous problems which need to be solved urgently. This paper presents the development stage and problems in the three largest metropolitan areas, designated as transport spheres, in Japan. Japan's problems in urban transportation are similar to those of most Western nations with regard to such issues as rapid urbanization, growth in travel, increasing auto ownership, growing transit operating deficits, rising wages and air pollution. The differences are the large modal split of transit from automobile trips, major expansion of the rail transit network, and the large number of transit operators in each urban area in Japan. In addition, governmental policies to help solve the urban transport problems are briefly described. In order to make the policies effective, coordination among government agencies is required. The establishment of a unified government agency is regarded as the first priority in dealing with the urban transport problem. It is expected that the government will offer bold new countermeasures to cope with urban transportation problems.

Noguchi, T (Washington University, Seattle) *Transportation (Netherlands)* Vol. 6 No. 2, June 1977, pp 171-190, 12 Fig., 3 Tab., Refs.

ACKNOWLEDGMENT: Transportation (Netherlands)  
ORDER FROM: ESL  
DOTL JC

25 157548

**TRAFFIC FORECASTS AS A BASIS FOR INTEGRATED TRANSPORT PLANNING [Verkehrsprognosen als Grundlagen einer integrierten Verkehrsplanung]**

The word "integrated" is highly fashionable at the moment and it means that the planning process is for an overall transport system including the operators (road haulers, railways, waterways and airlines) and the public

authorities that up until now dealt with their own forecasts for their own areas of activity on a regional, national and community basis. [German]

Macke, PA *Verkehrsannalen* Vol. 23 No. 6, 1976, pp 526-534, 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Verkehrsannalen, Vienna, Austria

25 157674

**URBAN TRANSPORTATION PLANNING GUIDE**

The new Canadian planning guide provides a summary of currently applied techniques and procedures for planning transportation facilities in urban areas in a North American context and presents an analytical structure for the planning process. The formulation of goals and objectives, the collection and analysis of data describing the operation of a system, policy formulation, current procedures in analyzing transportation systems, and the political process of implementation are all discussed. Reference is made to other more intensive material. The book is intended as an introductory treatise for engineers, planners, and other professionals working in the field as well as students and interested members of the public at large.

Roads and Transportation Association of Canada No Date, 167 pp

ORDER FROM: Toronto University Press, 33 East Tupper Street, Buffalo, New York, 14208

25 157905

**TRANSPORT COSTS AND REGIONAL DEVELOPMENT**

[Transportkostnader och regional utveckling. Modeller foer analys av regionalpolitiskt stoed au godstransporter]

In order to make the north of Sweden economically more viable, the government introduced transport subsidies as a means whereby the goal of increasing employment in the region can be realised. For this to be possible, there must be a direct relation between goods transport costs and economic development in different regions. This relation is a very complex one, and this study analyses it by an explicit model which endeavours to quantify the effects of a change in transport costs. The analysis is based on regional adaptation consisting of cost effects, production volume effects and employment effects. Cost effects depend on the mode of operation of the goods transport market, improvements, if any, in transport quality, advantages of large-scale production such as longer runs, and demand density. Analysis of volume effects assumes a homogeneous and infinite space, although this is in most cases heterogeneous. An industry is chosen as the suitable aggregation level, a difference being made between industries with a falling and a rising supply curve. A comparison is made between two hypothetical regions with different demand densities. The effects of support measures on the forestry industry in Upper Norrland are examined by empirical calculation. /TRRL/ [Swedish]

Ryden, I  
Stockholm School of Economics Monog Rpt. 1976, 208 pp, Figs., Tabs., Refs.

ACKNOWLEDGMENT: TRRL (IRRD 224559), National Swedish Road & Traffic Research Institute  
ORDER FROM: Stockholm School of Economics, Economics Research Institute, Box 6501, 113 83 Stockholm, Sweden

25 157907

**TRANSPORTATION POLICY-A FRAMEWORK FOR TRANSPORT IN CANADA SUMMARY REPORT**

This report is a summary of the policy and analytical work carried out in the course of the government's current review of transportation policy. It represents an attempt to develop a broad framework within which to examine transportation in Canada, a statement of policy, and a set of principles to guide the future development of the transportation system. /TRRL/

Department of Transport Monog Rpt. June 1975, 39 pp, Figs., Tabs.

ACKNOWLEDGMENT: TRRL (IRRD 224263), Roads and Transportation Association of Canada  
ORDER FROM: Department of Transport, Tower C, Place de Ville, Ottawa, Ontario K1A 0N5

25 157910

**RAIL, ROADS AND PAVLOV**

The article summarises reactions from various groups to the consultation document on transport policy. The author suggests that proposals contained in the document are contrary to the cherished beliefs of trade unionists and left-wing members of the Labour Party. British Rail generally support the policy since it would like to reduce its rail network by some 4000 route miles to a "basic" level. The two major rail unions (NUR and ASLEF) oppose any cuts and advocate nationalisation of road haulage. The road freight organisations are broadly in support but have reservations about increased lorry taxes. Local authorities want to take over bus licensing but public transport operatives want no major changes. Environmentalists oppose rail closures and would like anti-mobility policies promoted. The author suggests that demands for cuts in public spending will govern the final choice of policy. /TRRL/

Hall, P *New Society Analytic* Vol. 38 No. 741, Dec. 1976, pp 560-2

ACKNOWLEDGMENT: TRRL (IRRD 224377)

ORDER FROM: New Science Publications Limited, 128 Long Acre, London WC2 9QH, England

25 157956

**NATIONAL TRANSPORTATION POLICY ADMINISTRATION (TRANSITIONAL LESSONS FROM HOME AND ABROAD)**

The lessons to be learned by the U.S. from the transportation experience of Western Europe are examined. The U.S. experience is examined in the light of external perspective. The role of national policy and planning and the particular problems produced by private enterprise in the transport sector are discussed. The nationalized railroads are compared with the private U.S. railway industry. Conclusions are drawn about the importance of transport, nationalization, changes in regulatory climate, government investments, subsidies, research and development, and planning and management systems.

Hazard, JL (Michigan State University, East Lansing) *Transportation Journal* Vol. 16 No. 4, June 1977, pp 5-19, 1 Fig., 4 Tab., 4 Ref.

ORDER FROM: ESL

DOTL JC

25 157957

**RAILROADING THE ARMY ENGINEERS: A PROPOSAL FOR A NATIONAL TRANSPORTATION ENGINEERING AGENCY**

The authors see the U.S. Army Corps of Engineers, a large and competent agency, doing the wrong things as it plans and builds expensive, ineffective and environmentally destructive dams and reservoirs. At a time when the emerging national transportation program calls for massive rehabilitation of intercity railroad roadbeds and tracks, it is proposed that the Corps be reassigned from dams to railroads. The physical needs of the rail transport system, both in absolute terms and in social importance because of energy and employment considerations, far exceed those of the non-navigational aspects of water resources development.

Findley, RW Hannon, BM (Illinois University, Urbana) *Transportation Journal* Vol. 16 No. 4, June 1977, pp 70-77, 33 Ref.

ORDER FROM: ESL

DOTL JC

25 157958

**A SOCIAL DECISION-MAKING FRAMEWORK FOR ANALYZING RAIL SERVICE ABANDONMENT IMPACTS**

This paper discusses the analytical technique developed by the State of Wisconsin for its state rail plan to determine the relative social, economic and environmental impacts resulting from rail service discontinuance and to rank rail lines on a priority basis according to net social benefits. This plan, to establish eligibility under the 4R Act, differs from that of the 3R act in methods for qualifying for local rail service continuation subsidies.

Boske, LB Wolfgram, MJ (Wisconsin Department of Transportation) *Transportation Journal* Vol. 170 No. 4, June 1977, pp 78-85, 1 Tab., 15 Ref.

ORDER FROM: ESL

DOTL JC

25 265208

**A STUDY OF URBAN MASS TRANSPORTATION NEEDS AND FINANCING**

The report evaluates portions of the 1972 National Transportation Report pertaining to urban mass transportation and addresses specific subjects which include the refinement of urban mass transportation needs and determination of system operating and maintenance cost, the development of a program to accomplish the needs of each urban area for public mass transportation, the determination and comparison of fare structures of all urban mass transportation systems and their relationships to operating and maintenance costs, and the analysis of the financing capabilities of the Federal, State, and local governments for meeting urban mass transportation needs. Urban mass transportation needs as reported in the state long-range plans are expressed in terms of (1) capital investments from 1972 to 1990, (2) level of service in 1990, (3) projected system ridership in 1990, and (4) annual operating and maintenance costs and operating deficits in 1990. The development of a program to meet the needs is discussed, and the major findings of the analysis of the mid-range implementation programs (the 1980 programs) of the states and urban areas are presented. The planned capital outlay in rail per resident of urbanized areas served by rail is five times as large as the corresponding figure for bus over the period 1972 to 1992. Historical trends in fare structures and levels have been analyzed and the average fare nationwide of 34 cents is projected by the states to remain constant through 1990 in terms of 1971 constant dollars. Current state and local mass transportation financing programs are largely a mixture of direct appropriations from general funds often to provide support for transit system operating deficits; compensation for reduced fare programs; and a limited number of instances of special taxes. Two elements are proposed to meet the estimated financial mid-term (1980) program requirements of states and local governments: (1) on the Federal level, UTAP, and (2) state and local urban transportation financing programs based on farebox revenues and general revenues or specially designated taxes. Actions which could reduce the financial burden are discussed.

Report of the Secretary of Transportation to the United States Congress pursuant to Section 138(a), Public Law 93-87, The Federal-Aid Highway Act of 1973.

Peat, Marwick, Mitchell and Company, Office of Policy, Plans and International Affairs DOT/TPI/10-77/04, July 1974, 154 pp, Tabs., 1 App.

Contract DOT-OS-40064

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265242/8ST, 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 146774

**CRIME AND LAW ENFORCEMENT IN TRANSPORTATION SYSTEMS (A BIBLIOGRAPHY WITH ABSTRACTS)**

Studies are cited on cargo security, motor vehicle accidents involving crime, traffic law enforcement, the criminal justice aspects of motor vehicle operators who use drugs or alcoholic beverages, and other related topics. (This updated bibliography contains 68 abstracts, 20 of which are new entries to the previous edition.)

Supersedes NTIS/PS-75/732.(PC N01/MF N01)

Shonyo, C

National Technical Information Service Biblio. Nov. 1976, 73 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-76/0920/9ST, DOTL NTIS

26 149446

**RAIL PLANNING MANUAL. PRELIMINARY BIBLIOGRAPHY**

This Preliminary Bibliography, a supplement to Volume II of the Rail Planning Manual due for future distribution, was prepared to offer a timely planning resource to agencies facing increased involvement in rail planning. This bibliography presents three types of information. Section A, General References, describes documentation and reference materials related to the following topics: Organization for State Rail Planning, Light Density Lines, Mainline Planning, Special Studies, Participation and Coordination, Implementation and Administration, Rail Planning Related to Statewide Transportation Planning. Section B presents a compilation of important data sources. Section C lists pertinent items of legislation and regulation.

See also Volume I, RRIS 25 148595, 7702 (FRA-RFA-76-06, NTIS/PB-263182/AS).

Federal Railroad Administration Biblio. Dec. 1976, 52 pp

ACKNOWLEDGMENT:

ORDER FROM: NTIS

DOTL NTIS, DOTL RP

26 149461

**LITERATURE ON RAILWAYS USSR, 1967. VOLUMES 1-3 [Zheleznodorozhnia literatura SSSR 1967]**

This is a translation of the 1967 edition of a series of Annual Bibliographic Indexes of Literature published by the Central Scientific-Technical Library of the Ministry of Railways. While primary attention is given to the condition of and developments involving rail transport in the Soviet Union, the index does also contain foreign railway publications. Central and regional publications of the Ministries of Railways and Transport Production are covered along with certain non-transportation agencies. The output of main departments, development groups, scientific-research institutes, scientific-technical societies, institutions of higher education and certain directorates are included. The index also includes a description of books, articles from collections of works, journals and periodicals, specifications, standards and patents.

Translation from the Russian was prepared for the FRA, U.S. DOT, and the National Science Foundation by Mrs. Geti Saad.

Transport Publishing House Biblio. TT-71-53069, 1973, 1164 pp

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS, DOTL Z7231.A5Z54V1-3

26 151742

**TRANSPORTATION PLANNING AND IMPACT FORECASTING TOOLS**

This is one of eight information bulletins developed for the Urban Consortium for Technology Initiatives' Transportation Task Force. The Consortium is a coalition of 34 major urban governments, 28 cities and 6 counties, with populations over 500,000. This bulletin examines new tools, both automated and manual for transportation planning and analysis. Specific emphasis is given to the Urban Transportation Planning Systems (UTPS) package, its features and its application. An extensive list of contacts and an annotated bibliography are provided, including coverage of transportation planning models, land use models, and major impact assessments.

Prepared for Urban Consortium for Technology Initiatives. Transportation Task Force. See also PB-258 872.

French, BI Casebeer, EMC

Public Technology, Incorporated, Department of Transportation Final Rpt. DOT-TST-77-10, Oct. 1976, 40 pp

Contract DOT-OS-60076

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-263963/1ST, DOTL NTIS

26 152467

**INTERNATIONAL RAILWAY STATISTICS. STATISTICS OF INDIVIDUAL RAILWAYS. YEAR 1974**

No Abstract.

Raczkiewicz, M

International Union of Railways, BD Statistics No. 81, Feb. 1976, 213 pp, Tabs., 1 App.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: International Union of Railways, BD, Statistics Bureau, 14-16 rue Jean Rey, 75015 Paris, France

DOTL RP

26 152662

**DIRECTORY OF TRANSPORTATION EDUCATION**

A 204-page directory of degree and non-degree university-level courses in transportation has been published by the Department of Transportation. Included is an index showing what's taught where in a variety of specialties, including rail, water transport, pipelines, and so forth.

Department of Transportation Directory 1977, 204 pp, Refs.

ACKNOWLEDGMENT: Science &amp; Government Report

ORDER FROM: GPO

S/N-050-000-00121-1

26 153961

**BART IMPACT PROGRAM DATA CATALOG**

The document is a description of all of the data sets that have been collected or used by the various parts of the BART Impact Program. It is divided into sections according to study areas or projects within the overall program. These areas and all of the data sets within an area contain subject keywords which appear in the index, in addition to identification keywords. This catalog is intended for use by persons who wish to access the data itself. It contains information about the physical form of the data and its physical location, plus an abstract of each data set which may be quite lengthy. (Portions of this document are not fully legible.)

Prepared in cooperation with Department of Housing and Urban Development, Washington, D.C.

Metropolitan Transportation Commission, Department of Housing and Urban Development, Department of Transportation DOT-BIP-PD-27-1-76, Dec. 1976, 149 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264613/1ST, DOTL NTIS

26 153987

**URBAN MASS TRANSPORTATION ADMINISTRATION ABSTRACTS, VOLUME 3**

This volume is a reference document prepared by the Urban Mass Transportation Administration (UMTA) and serves as a guide to 298 reports generated under contract to UMTA. This document reflects UMTA's continuing commitment to the dissemination of technical report information to government, state, and local transportation planning bodies, private industry, and the general public. The types of documents abstracted in this volume are, by section: (I) Technical Studies; (II) Research, Development, and Demonstration Project reports; and (III) University Research and Training reports. Section IV contains complete indexes to the volume by report title, personal author, corporate author, geographic location, and keywords.

See also report dated Sep 73, PB-225 368.

Urban Mass Transportation Administration UMTA-TRIC-76-1, July 1976, 356 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264905/1ST, DOTL NTIS

26 154266

**ANNOTATED BIBLIOGRAPHY ON SNOW, ICE, AND PERMAFROST. VOLUME I**

The SIPRE Project concerns primarily the preparation of a bibliography in the field of snow, ice and permafrost. Basic tasks to be performed are: (1) to conduct library research in the field of snow, ice and permafrost and, in the light of the findings, to propose a plan for an annotated bibliography dealing with these and allied subjects; (2) to issue the bibliography and related publications in processed form after consultation with SIPRE; and (3) to act in a consultative capacity in the organization of bibliographic material already in the possession of SIPRE.

See also Volume 2, AD-495 996. Distribution limitation now removed.

Yerg, DG  
Library of Congress SIPRE-12-Vol-1, Sept. 1951, 231 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-495995/3ST, DOTL NTIS

26 154776

**TRANSPORTATION STATISTICAL DATA AND INFORMATION**

The document contains an extensive review of internal and external sources of transportation data and statistics especially created for data administrators. Organized around the transportation industry and around the elements of the U.S. Department of Transportation, it is the most comprehensive single document that reviews transportation data and its history.

Sponsored in part by Office of the Assistant Secretary for Policy, Plans and International Affairs (DOT), Washington, D.C. Office of Transportation Systems Analysis and Information.

Tap, R Kaprelian, A

Transportation Systems Center, Office of Policy, Plans and International Affairs Final Rpt. DOT-TSC-OST-76-60, Dec. 1976, 222 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265457/2ST, DOTL NTIS

26 157507

**A BIBLIOGRAPHY ON RAILROAD DEVELOPMENT AND URBANIZATION OF THE TRANS-MISSISSIPPI WEST, CIRCA 1860-1890**

No Abstract.

Nelson, T

Washington State University Bibliog. CPL-1288, 1977, 39 pp

ACKNOWLEDGMENT: Council of Planning Librarians

ORDER FROM: Council of Planning Librarians, Exchange Bibliographies, P.O. Box 229, Monticello, Illinois, 61856

26 157692

**RAILROAD RESEARCH BULLETIN--SPRING 1977. VOLUME 4, NUMBER 1**

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.

Sponsorship provided by the Federal Railroad Administration, U.S. Department of Transportation, Office of Research and Development.

Railroad Research Information Service, (7701) Bibliog. Vol. 4 No. 1, FRA/ORD-77/23, Mar. 1977, 436 pp, 1989 Ref.

ORDER FROM: Railroad Research Information Service, 2101 Constitution Avenue, NW, Washington, D.C., 20418

26 157906

**CONTAINERISATION**

The bibliography contains a wide range of references. Books, reports and papers, statistics, and selected periodicals and articles are listed, with brief abstracts. The sea, rail and road transport aspects of containerisation, design of containers, mechanics of bulk handling, strategic planning and economic aspects are covered. /TRRL/

Chartered Institute of Transport Bibliog. No. 103, Nov. 1975, 10 pp, Refs.

ACKNOWLEDGMENT: TRRL (IRRD 224673)

ORDER FROM: Chartered Institute of Transport, 80 Portland Place, London W1N 4DP, England

26 158179

**SPECIAL BIBLIOGRAPHY. RAILROAD TECHNICAL DOCUMENTS RECEIVED THROUGH U.S. BILATERAL AGREEMENTS**

This Special Bibliography contains 153 abstracts of foreign documents. These documents have been received by the Federal Railroad Administration through its bilateral agreements with the USSR Ministry of Railway Transport and the Ministry of Transport, Federal Republic of Germany. The abstracts are compiled from the magnetic tape files of the Railroad Research Information Service. The material in this volume is categorized in the following 17 of the 26 RRIS categories: Right-of-Way, Track, Rail Vehicles and Components, Propulsion Systems, Signals, Control and Communications, Human Factors, Rail-Highway Grade Crossings, Materials Science, Safety, Electrification, Information Systems, Economics, Freight Operations, Passenger Operations, Industry Structures and company Management, and Bibliographies and Documentation.

Prepared for the International Railroad Technology Transfer Seminar, New Orleans, Louisiana, January 14, 1976, under the sponsorship of the Office of Research and Development, FRA/U.S. DOT.

Railroad Research Information Service, (RRIS 77S1) Bibliog. FRA-  
/ORD-77/01, Jan. 1977, 56 pp, 153 Ref.

Contract DOT-OS-40022

ORDER FROM: Railroad Research Information Service, 2101 Constitution  
Avenue, NW, Washington, D.C., 20418

26 158209

**ANNUAL REPORT OF THE CANADIAN INSTITUTE OF  
GUIDED GROUND TRANSPORT, 1975-76. PART 1: RESEARCH  
PROJECT REPORTS**

These reports resulted from research conducted through CIGGT, the  
majority of which took place in 1975. Among the completed projects were

the Canadian Freight Transportation Model, a high-speed data acquisition  
system, inductive coupler for long-train communications, a two-sector trade  
model, spinal transportation network analysis, and driver behavior at  
signalized grade crossings. Reports on the preceding, as well as progress  
reports, are in the following sections: Communication and Control; Track  
Structures and Dynamics; Freezing Program; Economics and Management;  
Cybernetics and Operations Research; Magnetic Levitation; Human Fac-  
tors; Systems Studies and Special Projects.

Macdonald, JA Arnold, SIV  
Canadian Institute of Guided Ground Transport CIGGT-76-6, Apr.  
1976, 274 pp, Figs., Tabs., Refs., 1 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP



# Ongoing Research Summaries

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.

Update information not available as of August 1977.

### 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 Ad-

vanced 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 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)494-2006)

Contract DOT-TSC-836 (CPFF)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: June 1974 COMPLETION DATE: July 1977 TOTAL FUNDS: \$191,728

ACKNOWLEDGMENT: TRAIS (PR# TM-0013), 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

Handbook for Railroad Track Stabilization Using Lime Slurry Pressure Injection, FRA/ORD-77/30, June 1977

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: Completed NOTICE DATE: Aug. 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.

Update information not available as of August 1977.

**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, DH 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 058433

**PARTICIPATION IN DOT TUNNELING RESEARCH PROGRAM**

No Abstract.

Update information not available as of August 1977.

**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-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.

Update information not available as of August 1977.

**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.

Update information not available as of August 1977.

**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) 494-2006)

Contract DOT-TSC-1018

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** May 1975 **COMPLETION DATE:** July 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.

Update information not available as of August 1977.

**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, RE (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, RE (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.

Update information not available as of August 1977.

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) 426-9638)

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 adjacment 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.

Update information not available as of August 1977.

#### 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) 426-9638)

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 059406

##### TRANSIT INDUSTRY INPUT ON THE TUNNELING TECHNOLOGY PROGRAM

The American Public Transit Association will provide transit industry input, advice, and consensus on the Tunneling Technology Program. A review program will be established to review each of the UMTA/TSC R&D Contracts. Each panel will be comprised of experienced technical representatives of the transit industry.

Although under separate contract to UMTA, U.S. DOT, this project relates to ongoing research performed by the National Academy of Sciences' U.S. National Committee on Tunneling Technology.

PERFORMING AGENCY: American Public Transit Association

SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, DC-06-0129

RESPONSIBLE INDIVIDUAL: Butler, GL (Tel (202) 426-0090)

Contract DOT-UT-60016T (CR)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: July 1976 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$49,054

ACKNOWLEDGMENT: TRAIS (DC-06-0129)

#### 00 059870

##### EVALUATION OF PNEUMATIC SYSTEM FOR THE TRANSPORT OF MUCK IN TUNNELING

The objective is to provide an Experimental Design for the demonstration of a pneumatic system for the transport of muck in tunneling.

PERFORMING AGENCY: Small Business Administration

SPONSORING AGENCY: Urban Mass Transportation Administration, DC-06-0153

Contract UT-70011 (CPFF)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$21,502

ACKNOWLEDGMENT: TRAIS (DC-06-0153)

#### 00 059879

##### INSTALLATION OF SOIL SETTLEMENT INSTRUMENTATION IN SOFT GROUND TUNNEL CONSTRUCTION

This project provides for soil settlement instrumentation in soft ground tunnel construction and will provide for surface and subsurface soil settlement indicators in areas of chemically grouted and ungrouted soft ground tunnel construction.

PERFORMING AGENCY: Washington Metropolitan Area Transit Authority  
 INVESTIGATOR: Quenstedt, W  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, DC-06-0158

Grant DOT-DC-06-0158 (FFP)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Aug. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$86,000

ACKNOWLEDGMENT: TRAIS (DC-06-0158)

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 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

INVESTIGATOR: Townsend, FC Gilbert, PA

SPONSORING AGENCY: Waterways Experiment Station, DA05F8182

STATUS: Active NOTICE DATE: Feb. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 681821)

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 Engineering

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 Advanced Technology Applications, GI-34608X2; Department of Transportation

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STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1976 COMPLETION 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. Update information not available as of August 1977.

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)494-2006)

Contract DOT-TSC-1078  
STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1975 COMPLETION DATE: Sept. 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: Underground Technology Development Corporation  
INVESTIGATOR: Foster, E Toporoff, I  
SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Sluz, A (Tel (617)494-2431)

Contract DOT-TSC-1106  
STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Dec. 1975 COMPLETION DATE: Aug. 1977 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. The contract has been extended to July 1977 to allow for investigation of pneumatic pipeline head losses and conveyor costs.

PERFORMING AGENCY: Colorado School of Mines, CSM-ORS-P-363  
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: Completed NOTICE DATE: Aug. 1977 START DATE: Oct. 1975 COMPLETION DATE: July 1977 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, CSM-ORS-P-364  
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: Completed NOTICE DATE: Aug. 1977 START DATE: Feb. 1976 COMPLETION DATE: Aug. 1977 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.

REFERENCES:

Material Evaluation Study FRA-ORD-77-02, Jan. 1977

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: Garg, VK (Tel (312)567-3596)

STATUS: Active NOTICE DATE: Aug. 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

INVESTIGATOR: Townsend, FC Gilbert, PA

SPONSORING AGENCY: Waterways Experiment Station, 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 relatable 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

INVESTIGATOR: Townsend, FC

SPONSORING AGENCY: Waterways Experiment Station, 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

INVESTIGATOR: Alhussanini, MM Perry, EB

SPONSORING AGENCY: Waterways Experiment Station, DA0G8187

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 78187 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 Ad-

vanced 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 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, Aeronautics and Space  
 Technology Office, NASA

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

INVESTIGATOR: Huie, JS

SPONSORING AGENCY: Waterways Experiment Station, DA0M8183

STATUS: Active NOTICE DATE: Aug. 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: Waterways Experiment Station, 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, EMBLACEMENT 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: Waterways Experiment Station, 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**

The objective is to develop reliable design procedures & to encourage the adoption of improved construction techniques for tunnel support systems that satisfy structural and economic requirements. 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's work for 1977 and 1978 is focused on subjects considered by the committee to be of highest priority with respect to improvement of the art of underground construction and tunneling, and improvement of conditions to accelerate the use of improved technology throughout the United States. These include both technical and nontechnical activities. The committee will continue its work in encouraging governmental agencies and industry to adopt practices in contracting for underground construction which are more appropriate for this type of work than those which have been traditionally used in this country and to improve the education of engineers, both in the university programs and in continuing education programs, with the long range goal being the general upgrading of planning, design, and construction of underground works. The committee will undertake tasks to review sectors of underground construction technology development and to recommend to government, to industry, and to the universities, actions which should be taken to upgrade both the state of the art in that sector and the application of the most advanced and appropriate technologies in the national interest. Sectors to be reviewed in the 1977-78 period include site investigation capabilities and applications and deep cavity and tunnel support systems. 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 five cooperative projects are underway on the subjects planning use of the subsurface, research needs, and standardization, safety and contractual sharing of risk.

PERFORMING AGENCY: National Academy of Sciences; National Academy of Engineering

INVESTIGATOR: Israelsen, OA (Tel (202)389-6831)

SPONSORING AGENCY: Bureau of Mines

RESPONSIBLE INDIVIDUAL: Schmidt, WB (Tel (202)634-1249)

Contract JO 177032

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1972 COMPLETION DATE: Dec. 1978

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 participate for the United States in the International Society for Rock Mechanics and assist with international efforts to coordinate rock mechanics research. The Committee's activities include identification of research needs, preparation of advisory reports, coordination and participation in domestic and international professional conferences and symposia, and periodic reviews and surveys of national research efforts in rock mechanics and related fields.

Also sponsored by 11 Federal agencies and 10 professional societies.

PERFORMING AGENCY: National Academy of Sciences; National Academy of Engineering

INVESTIGATOR: Israelsen, OA (Tel (202) 389-6831)

SPONSORING AGENCY: Bureau of Mines

RESPONSIBLE INDIVIDUAL: Schmidt, WB (Tel (202) 634-1249)

Contract JO 177031

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Dec. 1967 COMPLETION DATE: Dec. 1978

#### 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 1977 START DATE: Jan. 1976 COMPLETION DATE: Aug. 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.

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 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  
 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: Aug. 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, Division of Advanced Product Research and Technology, 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, Division of Advanced Product Research and Technology, 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 Technology 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.

Update information not available as of August 1977.

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: Washington Metropolitan Area Transit Authority, 703/321-9000

INVESTIGATOR: Garrett, VK, Jr (Tel (202) 637-1158)

SPONSORING AGENCY: Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Linger, D (Tel (202) 557-5272)

Contract DOT-FH-11-9248

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1977 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$40,000

ACKNOWLEDGMENT: Washington Metropolitan Area Transit Authority

00 153558

**DEVELOPMENT OF COLORADO LAND USE DATA SYSTEM**

To develop technical criteria for identifying potential areas of natural hazard; e.g., floods, landslides, etc. Assess legal requirements of physical data for the designation of natural hazard areas. Develop the process of land use capability classification. Develop a technique for assessing the "environmental carrying capacity" as a land use planning tool. Assess the data system needs for a state land use data bank and develop appropriate software compatible with these needs.

**REFERENCES:**

The River Environment Simons, DB; Lagasse, PF; Chen, HH; Schumm, SA, Dept of Intl, Fish & Wildlife Serv, Twin Cities, Minn, Reference Document, Dec. 1975

Identification of Landslides and Mudflow Hazards Related to Land Utilization Development, Simons, DB, Reference Document, 1975

PERFORMING AGENCY: Colorado State University, Fort Collins, Department of Civil Engineering, CSRS COL

INVESTIGATOR: Simons, DB Wengert, NI Heil, R

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: July 1975 COMPLETION DATE: June 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0068159)

00 156203

**THE MANAGEMENT OF MAJOR UNDERGROUND CONSTRUCTION PROJECTS**

This is an 18-month study, begun on March 1, 1977, to identify in major urban underground construction projects the practices and procedures which contribute to unnecessary escalation of costs and to recommend improved procedures. The study will include a detailed analysis of a hypothetical, urban, underground construction project. Elements will be examined to determine what changes should be made to reduce negative impacts. The study will concentrate on steps involved in the management process, their essentiality and interdependence, and how they can be improved.

This project also has received funding, under separate contracts, from the National Science Foundation and the Office of the Secretary, U.S. DOT. See also RRIS 059406.

PERFORMING AGENCY: National Academy of Sciences, United States National Committee on Tunneling Technology

INVESTIGATOR: Israelsen, OA (Tel (202)389-6831)

SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation; Transportation Systems Center, Department of Transportation

RESPONSIBLE INDIVIDUAL: Chin, A Transportation Systems Center (Tel (617)494-2000)

Contract DOT-TSC-1290

STATUS: Active NOTICE DATE: May 1977 START DATE: Mar. 1977 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: National Academy of Sciences-Natl Research Council

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: Garg, VK (Tel (312) 567-3596) Thompson, MR (Tel (217) 333-3930)  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: McCafferty, RM (Tel (202)426-4377)

Contract DOT-FR-30038 (CR)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1973 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$673,029

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) 299-3151)  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: O'Sullivan, WB

Contract DOT-FR-30051 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1973 COMPLETION DATE: 1979 TOTAL FUNDS: \$332,110

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) 494-2457)

STATUS: Completed NOTICE DATE: Aug. 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. Intern Report, Meacham, HC, Dec. 1975  
 Rail Inspection Systems Analysis and Technology Survey. Phase I, Final Report, Kaiser, WD, May 1976

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: Aug. 1977 START DATE: Mar. 1975 TOTAL FUNDS: \$163,370

ACKNOWLEDGMENT: 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  
 INVESTIGATOR:  
 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: Aug. 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 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 Company

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development, RR-519

RESPONSIBLE INDIVIDUAL: Steele, RK (Tel (617) 494-2457)

Contract DOT-TSC-1048

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Sept. 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 DOT-FR-54190 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$1,700,000

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) 494-2649)

Contract DOT-TSC-1044

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$478,461

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

01 059223

**STATISTICAL REPRESENTATIONS OF TRACK GEOMETRY, WHEEL/RAIL FORCES AND DERAILMENT TENDENCIES**

The objective is to conduct analyses of existing track geometry data, wheel rail forces and derailment tendencies, in order to provide power spectral density and/or other statistical characterizations of the universe of track geometry conditions.

PERFORMING AGENCY: ENSCO, Incorporated

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6321

RESPONSIBLE INDIVIDUAL: Weinstock, H (Tel (617)494-2000)

Contract DOT-TSC-1211 (CPF)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$87,792

ACKNOWLEDGMENT: TRAIS (R6321)

01 059227

**USE OF SURFACE ELECTROMAGNETIC WAVES TO DETECT RAIL JOINT FAULTS**

The objective of this study is to determine experimentally the characteristics of surface electromagnetic waves (SEW)--transmission, reflection and radiation due to various defective and nondefective rail joints. These experiments are designed to verify the theoretical results for an ideal rail joint and to measure the effects of various perturbations of the rail joint. Also suitable techniques for coupling surface electromagnetic waves to the rail will be investigated. One outcome of this study will be a realistic evaluation of the applicability of the SEW technique to the detection of rail joint faults from a track-guided vehicle.

PERFORMING AGENCY: Missouri University, Rolla

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6357

RESPONSIBLE INDIVIDUAL: Yoh, P (Tel (617)494-2000)

Contract DOT-TSC-1217 (CR)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$56,690

ACKNOWLEDGMENT: TRAIS (R6357)

01 059295

**TRACK GEOMETRY MEASUREMENT BY HIGH RAIL VEHICLE**

The need for increased track surveillance capability and data collection capability for transportation planning and rail assistance programming has led Iowa's Department of Transportation to purchase a high rail track geometry measuring vehicle. The objective is to examine the capabilities of this vehicle to assist in the improvement of track safety inspection and in data collection for transportation planning and assistance programming. The project will examine both technical and operational aspects of Track Geometry Car usage as an inspection device and as a data collection device.

PERFORMING AGENCY: Iowa Department of Transportation

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Ferrara, J

Contract DOT-FR-64243 (CR)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1976 COMPLETION DATE: May 1978 TOTAL FUNDS: \$273,415

ACKNOWLEDGMENT: TRAIS

01 059371

**IMPROVEMENT OF MAGNETIC TECHNIQUES FOR RAIL INSPECTION**

The objective is to improve the magnetic inspection techniques through improvement of the sensing and signal processing methods. The opinion in the railroad industry is that although the ultrasonic systems appear to have the greater potential, it requires further development before it can perform a thorough and complete inspection. Until these techniques are upgraded and proven in the field, magnetic inspection methods offer a good supplementary inspection. The intent is to improve magnetic inspection techniques and equipment so that the performance is improved when operated as an independent system or when providing supplementary support to ultrasonic systems.

PERFORMING AGENCY: Battelle Memorial Institute  
 SPONSORING AGENCY: Transportation Systems Center, Department of  
 Transportation, R6345  
 RESPONSIBLE INDIVIDUAL: Ceccon, H (Tel (617)494-2000)

Contract DOT-TSC-1244 (CPF)  
 STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Aug.  
 1976 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$97,994

ACKNOWLEDGMENT: TRAIS (R6345)

01 059681

**TEST AND VALUATION OF THE TRACK GEOMETRY  
 MEASUREMENT SYSTEM (TGMS)**

The objectives are to: (1) Demonstrate the TGMS on the selected transit property. (2) Evaluate the TGMS under real world operating conditions on the selected transit property. (3) Collect track geometry data on the selected property. (4) Develop a Ways and Structures Maintenance Plan utilizing the TGMS. (5) Determine minimum requirements for real-time output from the TGMS to support Ways and Structures inspection under the Maintenance Plan, and identify the minimum component parts and operating characteristics of TSCs TGMS needed to achieve the minimum real-time output requirements.

PERFORMING AGENCY: Systems Technology Associates, Incorporated  
 SPONSORING AGENCY: Transportation Systems Center, Department of  
 Transportation, R6732

Contract DOT-TSC-1285 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept.  
 1976 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$245,436

ACKNOWLEDGMENT: TRAIS (R6732)

01 059701

**DEVELOPMENT AND TESTING OF AN AUTOMATIC RAIL  
 WEAR MEASURING SYSTEM**

The objective is to provide, through component inspections and evaluations, improved rail performance for increasing the overall safety of rail operations.

PERFORMING AGENCY: KLD Associates Incorporated  
 SPONSORING AGENCY: Transportation Systems Center, Department of  
 Transportation, R6345

Contract DOT-TSC-1280 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept.  
 1976 COMPLETION DATE: Oct. 1976 TOTAL FUNDS: \$138,932

ACKNOWLEDGMENT: TRAIS (R6345)

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: Garg, VK (Tel (312) 567-3596)  
 SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel (312) 567-3585)  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan.  
 1975 COMPLETION DATE: June 1978

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.

Final report available in October 1977.

PERFORMING AGENCY: Stanford Research Institute  
 INVESTIGATOR: Anyos, T  
 SPONSORING AGENCY: Federal Railroad Administration, Office of Rail  
 Safety Research; Transportation Systems Center, Office of Ground Systems  
 RESPONSIBLE INDIVIDUAL: McConnell, DP (Tel (617) 494-2451)

Contract DOT-TSC-NASW-876  
 STATUS: Completed NOTICE DATE: Aug. 1977 COMPLETION DATE:  
 June 1977 TOTAL FUNDS: \$59,263

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: Aug. 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, 260 tests on some 25 different railroads covered approximately 100,000 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. 1977 TOTAL FUNDS: \$6,245,000

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: Garg, VK (Tel (312) 567-3596)

STATUS: Active NOTICE DATE: Aug. 1977

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: Garg, VK (Tel (312) 567-3596)

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: AAR

01 099396

#### ACOUSTICAL EMISSION MONITORING OF FIELD AND PLANT WELDS

Acoustical 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: Garg, VK (Tel (312) 567-3596)

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: AAR

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. Field tests being run at FAST track in Pueblo, Colorado.

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: Aug. 1977 START DATE: Jan. 1976  
 COMPLETION DATE: June 1978 TOTAL FUNDS: \$350,000

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, PR (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: Aug. 1977 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: Aug. 1977 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.  
 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 Research and Development Center, Department of Transport, Canada

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: June 1975

#### 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.

##### REFERENCES:

Preliminary Description of Stresses in Rails Johns, TG and Davies, KB, Report FRA-ORD-76-294

PERFORMING AGENCY: Battelle Columbus Laboratories

INVESTIGATOR: Johns, TG (Tel (614)424-4569)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development; Transportation Systems Center, Office of Ground Systems

RESPONSIBLE INDIVIDUAL: McConnell, DP (Tel (617)494-2699)

Contract DOT-TSC-1038

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: May 1978 TOTAL FUNDS: \$429,000

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.

##### REFERENCES:

Kansas Test Track Instrumentation Internal Letter Report, July 1976

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: Aug. 1977 START DATE: July 1971 COMPLETION DATE: Oct. 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, JC (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: Aug. 1977 START DATE: Aug. 1975 COMPLETION DATE: Dec. 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.

##### REFERENCES:

Analysis of Kansas Test Track Beam Response FRA-ORD-77/31, June 1977

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: Completed NOTICE DATE: Aug. 1977 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 148355

##### ROAD MAINTENANCE COST MODEL

The road maintenance cost model project is directed towards the construction of a large computer model which will simulate the processes by which rail, ties and ballast in a length of track deteriorate under a selected traffic of varied composition to levels which necessitate their periodic replacement. The model is designed to estimate the impact of given traffic mixes on track component replacement cycles in a specified type of track through the employment of a series of theoretical/empirical wear models. Incremental costs are to be determined by a routine that deletes each segment of the traffic mix in turn, converting the estimated service life differential to an appropriate annual charge which reflects the simulated "consumption" of the track asset. The ultimate objective of the road maintenance cost model research is the formulation of a total framework for the conversion of ongoing research efforts into a methodology for the estimation of route-and service-specific unit costs for road maintenance. Progress to date has seen the construction of a workable rail wear/cost model which is presently in the calibration and validation stage.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport

INVESTIGATOR: Roney, MD (Tel (613) 547-5777) Lake, RW

SPONSORING AGENCY: Canadian National Railways

RESPONSIBLE INDIVIDUAL: Bucholz, E (Tel (514) 877-4860)

Contract

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$48,250

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

#### 01 159636

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

The original full application for research aid covered five years and involved a study of the stresses and deformations under dynamic and static load systems in railway track structure and support. The primary financing was awarded in 1971 for a study of the geotechnical properties of different ballast materials. Vibration characteristics, strength, stress strain characteristics, density and disintegration of the ballast are the main soil properties being studied. Expansion of the project to involve a more complete study of soil layer interaction when placed in the form of a track support was later approved and commenced. This involves large scale testing. The equipment for this testing has been assembled and the first tests commenced.

##### REFERENCES:

A Study of Stresses & Deformations Under Dynamic & Static Load Systems in Track Structure & Support, Raymond, GP, Canadian Inst of Guided Ground Transport, Rpt 75-10, Sept. 1975

# Track and Structures

01A

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport,  
2.22.76

INVESTIGATOR: Raymond, GP (Tel 547-5904)

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan.  
1971 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$92,000

ACKNOWLEDGMENT: CIGGT

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 Cooperrider, 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, DM (Tel (202)426-1227)

STATUS: Active NOTICE DATE: Aug. 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 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.

Update information not available as of August 1977.

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.

REFERENCES:

Wayside Derailment Inspection Requirements Study for Frarey, JL; Smith, RL; Krauter, AI, FRA/ORD-77-18

PERFORMING AGENCY: Shaker Research Corporation

INVESTIGATOR: Frarey, JL

SPONSORING AGENCY: Transportation Systems Center, RR-523

RESPONSIBLE INDIVIDUAL: Ehrehbeck, R (Tel (617) 494-2273 X2046)

Contract DOT-TSC-1029 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1975 COMPLETION DATE: Sept. 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, Department of Mechanical Engineering

RESPONSIBLE INDIVIDUAL: Ravera, RJ (Tel (202)426-9365)

Contract DOT-OS-50107 (CS)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$128,000

ACKNOWLEDGMENT: TRAIS (PUR-50175), OST

## 02 059302

**PHASE II TRACK-TRAIN DYNAMICS PROGRAM**

The International Government-Industry Research Program on Track Train Dynamics is a 10-year, three phase research effort directed toward the alleviation of the adverse effects of track train dynamics. New equipment in revenue service and changes in train make-up practices have contributed to an increasing number of train accidents. Alleviation of the personnel casualties, equipment damage, and lading damage which result from adverse dynamic interactions will allow the industry to improve safety records, work at a higher efficiency, provide more dependable and reliable service, and supply continuing low-cost transportation service.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Sperty, JP (Tel (202)426-9460)

Contract DOT-FR-64228 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: June 1979 TOTAL FUNDS: \$699,442

ACKNOWLEDGMENT: TRAIS

## 02 059427

**FREIGHT CAR DYNAMICS RESEARCH PROGRAM**

Develop mathematical models that may be used to understand the dynamic behavior of freight cars and the effects of various truck, car and track design parameters on their behavior. Validate these models with data gathered by the Track-Train Dynamics Program.

PERFORMING AGENCY: Clemson University

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Tsai, N (Tel (202)755-1877)

Contract DOT-OS-40018 (CR)

STATUS: Active NOTICE DATE: July 1977 START DATE: Nov. 1973 COMPLETION DATE: June 1978 TOTAL FUNDS: \$313,787

ACKNOWLEDGMENT: TRAIS

## 02 059436

**SWITCHYARD IMPACT TEST PROGRAM**

No Abstract.

PERFORMING AGENCY: National Bureau of Standards, Department of Commerce

INVESTIGATOR: Ward, LM

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Dancer, DM (Tel (202)426-1227)

IA DOT-AR-40008

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$302,060

ACKNOWLEDGMENT: TRAIS

## 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-146) Hawthorne, KL (Tel (312) 225-9600 X-146) Garg, VK (Tel (312) 567-3596)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1977 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 Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1977 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 Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1977 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: Garg, VK (Tel (312) 567-3596) Moyar, GJ (Tel (312) 225-9600 X-877)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel 312-225-9600 X-1463)

STATUS: Active NOTICE DATE: Aug. 1977 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) 225-96000 X-86)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Research and Development Center, Department of Transport, Canada

STATUS: Active NOTICE DATE: Aug. 1977 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 modifi-

cation 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.

REFERENCES:

Evaluation of Analytical and Experimental Methodologies for the Characterization of Wheel/Rail Loads, Ahlbeck, D; Harrison, H; Prause, R; Johnson, M, FRA-OR&D 76-276, Intrm Rpt., Nov. 1976

PERFORMING AGENCY: Battelle Memorial Institute

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

RESPONSIBLE INDIVIDUAL: McConnell, DP (Tel (617) 494-2649)

Contract DOT-TSC-1051

STATUS: Active START DATE: July 1975 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$583,000

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 additional 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.

## REFERENCES:

Study on Beer Can Damage-Strength and Dimensional Characteristics of Aluminum, Tin Plate & Tin Free Steel Cans, AAR Rpt R-230, RRIS 02 138569, 7702

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

STATUS: Active NOTICE DATE: Aug. 1977

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 Research and Development Center, Department of Transport, Canada

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: AAR

## 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, and a report is in preparation. 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: Completed NOTICE DATE: Aug. 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 & Communication, 3605

INVESTIGATOR: Colavincenzo, O

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication, 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 specifica-

tions 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.

PERFORMING AGENCY: Wyle Laboratories  
 INVESTIGATOR: De Benedet, D (Tel (303)697-4500) Cappel, K  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Fay, GR (Tel (202) 426-0855)

Contract DOT-FR-742-4277

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1977 COMPLETION DATE: Feb. 1980 TOTAL FUNDS: \$260,000

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: Aug. 1977 START DATE: Apr. 1976 COMPLETION DATE: Dec. 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 completed.

##### 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

Dynamic Simulation of Freight Car and Lading During Impact, AAR Rpt R-249

PERFORMING AGENCY: Illinois Institute of Technology; Association of American Railroads Technical Center  
 SPONSORING AGENCY: Association of American Railroads Technical Center

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: 1974

#### 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 been 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 11. FAST COORDINATION

The Facility for Accelerated Service Test (FAST) 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 Research and Development Center, Department of Transport, Canada

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: Oct. 1975

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: Aug. 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 100 million gross ton miles generated by July 15, 1977.

PERFORMING AGENCY: Federal Railroad Administration, Office of Research and Development

SPONSORING AGENCY: Federal Railroad Administration, Office of Re-

search and Development; Association of American Railroads  
 RESPONSIBLE INDIVIDUAL: Spanton, DL (Tel (202) 426-0850)

STATUS: Active NOTICE DATE: Aug. 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: Aug. 1977 COMPLETION DATE: June 1978  
 TOTAL FUNDS: \$69,308

ACKNOWLEDGMENT: TSC

**02 157664**

**EXPERIMENTAL MEASUREMENTS OF NORMAL SHOCK AND VIBRATION ENVIRONMENTS**

Extract and document, in a usable format, the current information on normal shock and vibration loading experienced by radioactive material shipping containers. This will involve: (1) Extraction of data from existing data banks; (2) Conducting of dynamic analysis of switching and coupling shocks; (3) Participation in appropriate test programs.

REFERENCES:

Shock and Vibration Environments for Large Shipping Containers on Rail Cars and Trucks, Magnuson, C, SAND-76-0427; NUREG-76-6510, May 1977

PERFORMING AGENCY: Sandia Laboratories, A-1049

INVESTIGATOR: Magnuson, C (Tel (505)264-2765)

SPONSORING AGENCY: Nuclear Regulatory Commission

RESPONSIBLE INDIVIDUAL: LaHS, W Nuclear Regulatory Commission (Tel (301)427-4356)

Contract B&R-60190504

STATUS: Active NOTICE DATE: July 1977 START DATE: Dec. 1975  
 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$365,000

ACKNOWLEDGMENT: Nuclear Regulatory Commission

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 August 1977 and 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) 522-3200)

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: June 1971 COMPLETION DATE: Dec. 1979 TOTAL FUNDS: \$45,700,000

ACKNOWLEDGMENT: UMTA (IT-06-0026)

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: Completed NOTICE DATE: Aug. 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. When an adequate mathematical model is developed to predict the temperature influenced stresses in a car wheel, these stresses will be superimposed on the stresses developed by the railroad. These results should lead to a better understanding of the various types of failures experienced in service.

PERFORMING AGENCY: Illinois University, Urbana, Department of Theoretical and Applied Mechanics

INVESTIGATOR: Wetenkamp, HR

SPONSORING AGENCY: Griffin Wheel Company

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Science Information Exchange (JGF 25)

03 050338

**ARTICULATED RAIL CAR TRUCK DEVELOPMENT**

Develop a dramatically improved freight car truck. Background information is now being applied to basic design of (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, referred to as the Type DR-1.

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 have tooled up for testing of multiple car sets. AAR certification has been received. Several U.S. railroads will conduct service tests.

## REFERENCES:

An Evaluation of Recent Developments in Rail Car Truck Design, List, HA, ASME #71-RR-1, Apr. 1971, RRIS #050340 in 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: Aug. 1977 START DATE: Jan. 1971 COMPLETION DATE: 1978

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: Aug. 1977 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: Aug. 1977 START DATE: June 1974 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)494-2457)

Contract DOT-TSC-855 (CPFF)  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1974 COMPLETION DATE: Dec. 1977 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)494-2457)

Contract DOT-TSC-917 (CPFF)  
 STATUS: Completed NOTICE DATE: Aug. 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: Allen, G  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, RR-523  
 RESPONSIBLE INDIVIDUAL: Yearwood, KW (Tel (617)494-2046)

Contract DOT-TSC-935 (CPFF)  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1974 COMPLETION DATE: Aug. 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)494-2651)

Contract DOT-TSC-1087  
 STATUS: Completed NOTICE DATE: Aug. 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, FRA/ORD-76-272, July 1976

A Mathematical-Computer Simulation of the Dynamics of a Freight Element in a Railroad Freight Car, Shum KL; Willis, T, Illinois Institute of Technology, FRA/ORD-77/28, July 1977

Structural Vibration Noise Abatement of a Large Diesel Engine, Varma, PK; Kumar, S, Illinois Institute of Technology, FRA/ORD-76/273, July 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, FRA/ORD-76/271, July 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: Completed 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.

REFERENCES:

Fatigue Evaluation of Prototype Tank Car Head Shield: Volume 1, Johnson, MR, Aug. 1976

Test Plan for Accelerated Life Testing of Thermally Shielded Tank Cars: Volume 2, Johnson, MR; Viergutz, OJ, Sept. 1976

PERFORMING AGENCY: IIT Research Institute, J6361  
 INVESTIGATOR: Johnson, MR (Tel (312) 567-4788)  
 SPONSORING AGENCY: Transportation Systems Center, RR-525  
 RESPONSIBLE INDIVIDUAL: Raab, AR (Tel (617)494-2539)

Contract DOT-TSC-1043 (CPFF)  
 STATUS: Completed NOTICE DATE: June 1977 COMPLETION DATE:  
 June 1977 TOTAL FUNDS: \$102,015

ACKNOWLEDGMENT: TRAIS (RR-525)

03 058726

**PROCUREMENT OF AN IN-TRACK WHEEL RIM INSPECTION SYSTEM**

Through transmission and pulse-echo ultrasonic techniques are used to detect rail cars and locomotive wheels for defects in the running surface. Wheels are tested in-motion, by two ultrasonic units which are installed in special rail assemblies, one for each rail of the track.

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) 494-2046)

Contract TSC-1070 (FFP)  
 STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: Sept.  
 1977 TOTAL FUNDS: \$113,426

ACKNOWLEDGMENT: TRAIS

03 059136

**ACOUSTIC SIGNATURE OF RAILROAD WHEELS**

1) Develop a wheel exciter to assure reliable, uniform and repeatable impact of excitation at an optimum location of a passing railcar wheel and to achieve sufficient ruggedness of construction to withstand field conditions. 2) Develop and document data to permit discrimination between a defined flawed wheel and a non-flawed wheel, based upon the demonstrated ability of this technique to identify rim cracks, plate cracks, both in depth and size.

PERFORMING AGENCY: Houston University  
 INVESTIGATOR: Finch, RD  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Coutts, FW (Tel (617)494-2000)

Contract DOT-TSC-1187 (CR)  
 STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Apr.  
 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$73,000

ACKNOWLEDGMENT: TRAIS

03 059296

**METROLINER CAR TRUCK UPGRADING**

The contractor shall design, fabricate, assemble and test improved Metro-liner trucks.

PERFORMING AGENCY: General Steel Industries, Incorporated  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

Contract DOT-FR-64237 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June  
 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$637,925

ACKNOWLEDGMENT: TRAIS

03 059345

**PROVIDE RESOURCES FOR TESTING OF THERMALLY SHIELDED TANK CARS**

No Abstract.

PERFORMING AGENCY: Federal Railroad Administration, Department of Transportation  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

ID DOT-RA-76-44 (CR)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: June  
 1976 COMPLETION DATE: July 1976 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: TRAIS

03 059420

**PERFORMANCE EVALUATION OF LIGHTWEIGHT INTERMODAL FLAT CARS**

Measurement of ride vibration and wear characteristics of two experimental lightweight skeleton TOGC and COFC flat cars in addition to standard TTAX car. Program includes 150,000 miles of revenue service with periodic measurements of ride vibration and wear.

Co-sponsored by an industry group including the Trailer-Train Company, Pullman-Standard Company, National Castings Division of Midland Ross, American Steel Foundaries Company.

PERFORMING AGENCY: Atchison, Topeka and Santa Fe Railway; ENSCO, Incorporated

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Blanchfield, JR Federal Railroad Administration (Tel (202)426-0808)

Contract DOT-FR-65218  
 STATUS: Active NOTICE DATE: July 1977 START DATE: Aug.  
 1976 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$750,000

ACKNOWLEDGMENT: TRAIS

03 059861

**SUPPORT FOR URBAN RAPID RAIL VEHICLES**

The Urban Rapid Rail Vehicles and Systems (URRVS) Program includes two parallel efforts. One activity is directed toward completion of the Advanced Concept Train (ACT-1). The other activity supports the Advanced Subsystem Development Program (ASDP).

See also RRIS 03A 136342 and 03A 138539.

PERFORMING AGENCY: American Public Transit Association  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, DC-06-0138

Contract DOT-UT-60060 (CR)  
 STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Aug.  
 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$120,000

ACKNOWLEDGMENT: TRAIS (DC-06-0138)

03 059873

**COST REDUCTION IMPROVEMENTS FOR LTV/SIG TRUCK DESIGN**

The objectives are: (1) the cost reduction of the present LTV/SIG truck design developed under contract FR-20049, and (2) improvement of the truck maintenance costs and reliability without compromising the advantages of performance.

PERFORMING AGENCY: Vought Corporation, LTV Corporation  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Sperty, JP (Tel (202) 755-9460)

Contract DOT-FR-74230 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec.  
 1976 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$34,592

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. 1977 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: Garg, VK (Tel (312) 567-3596) Korpics, F (Tel (312) 225-9600 X877)  
 SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Research and Development Center, Department of Transport,

Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel (312) 225-9600 X1463)

STATUS: Active NOTICE DATE: Aug. 1977 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 X862)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel (312) 225-9600 X1463)

STATUS: Active NOTICE DATE: Aug. 1977 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 X866) Brown, TR (Tel (312) 225-9600 X866)

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel (312) 225-9600 X1463)

STATUS: Active NOTICE DATE: Aug. 1977 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 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 and protective skid proposals. The objectives are to develop design parameters for bottom fittings breakage grooves and protective skids.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA (Tel (312) 567-3607)

STATUS: Active NOTICE DATE: Aug. 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 sill 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) 567-3607)

STATUS: Active NOTICE DATE: Aug. 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 has developed 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 incorporates 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 original contract, a number of potentially feasible conceptual alternative locomotive cab configurations were developed. The most suitable alternate was selected on the basis of human factors, structural integrity, and cost trade-off studies now in progress. In Phase II of the original contract, a detailed human factors design of the optimal locomotive cab was accomplished, and a full scale mock-up fabricated. Operational feasibility was determined in a limited series of performance tests utilizing the mock-up. Under the present contract modification, the scope of the test programs will be increased to include a nationwide sample of evaluators from heavy rail properties. The sample will consist of engineers and trainmen representing geographic, operational and experimental variables necessary to accomplish a broad based evaluation. As a result of the evaluation, human factors engineering functional specifications for a new locomotive cab will be written to include requirements for all man/software/hardware interfaces of the cab design. In addition, recommendations will be made on appropriate areas for further work, including suggestions for areas other than the immediate cab environment, such as the potential for new methods of train handling, communication techniques, and signalling systems.

Funds for this project are administered by DOT/Transportation Systems Center, Cambridge, Mass.

##### REFERENCES:

- 1 Human Factors Engineering Systems Functional Analysis Tech Rpt. No. 1  
Locomotive Cab Design Dev: V1, Anal of Locomotive Cab Environment and Dev of Cab Design Alternatives, Robinson, J; Piccione, D; Lamers, G, FRA/ORD-76-275 I, Oct. 1976
- Locomotive Cab Design Development: V2 Operators Manual Robinson, J; Piccione, D, FRA/ORD-76-275 II, Oct. 1976
- Locomotive Cab Design Development: V3, Design Applications Analysis, Robinson, J, FRA/ORD-76-275 III, Oct. 1976

PERFORMING AGENCY: Boeing Vertol Company, D339-10044  
 INVESTIGATOR: Robinson, J (Tel (215) 522-2760)  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Story, AW (Tel (617) 494-2594)

Contract DOT-TSC-1330  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1977  
 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$442,313

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. NAVSURFWPNCEN/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: O'Steen, J  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Levine, D (Tel (202) 426-1227)

IA AR54162  
 STATUS: Active NOTICE DATE: Aug. 1977

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 & Communication, Can, 3110  
 INVESTIGATOR: Young, J Elliott, L  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communication, 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 & Communication, Can, 3109  
 INVESTIGATOR: Curmi, RA Elliott, GI  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communication, 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 test and evaluation at TSC. 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. 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: AiResearch Manufacturing Company, 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: Aug. 1977 START DATE: Mar. 1972  
 COMPLETION DATE: June 1978

**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 half car shell, and will be optimized on configuration, actuation, & time cycle. 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, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Mora, J (Tel (202) 426-0090)

Contract DOT-UT-60045  
 STATUS: Active NOTICE DATE: Aug. 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 an advanced dual powered commuter cars 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. Four GT/E cars were built by General Electric and four by Garrett AiResearch. Two Garrett cars were tested briefly at the DOT Transportation Test Center, Pueblo, Colo. All eight cars were tested in non-revenue service beginning in 1975 on the Long Island Rail Road, and entered revenue service in 1976 for a 12 month evaluation period.

Subcontractors are Garrett AiResearch and General Electric Company and Louis T. Klauder and Associates.

PERFORMING AGENCY: Metropolitan Transportation Authority of New York

SPONSORING AGENCY: Urban Mass Transportation Administration; Metropolitan Transportation Authority of New York

RESPONSIBLE INDIVIDUAL: Mora, J (Tel (202) 426-0090)

Contract DOT-UT-613

STATUS: Active NOTICE DATE: Aug. 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. The goal of the project is to achieve 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 evolutionary improvement in technology.

#### REFERENCES:

Determination of the Optimal Approach to Rail Rapid Transit Car Standardization, NTIS, Final Report 131 pp, PB-259363

PERFORMING AGENCY: International Research and Technology Corporation

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Mora, J

Contract

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1976 TOTAL FUNDS: \$100,000

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: Aug. 1977 START DATE: Dec. 1976 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 completed on the Philadelphia Area Port Authority Transit Corp. in February 1977.

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: Completed NOTICE DATE: Aug. 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: Aug. 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: Aug. 1977 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, and rolling resistance in curves are major objectives.

#### REFERENCES:

Self-Steering Wheelsets Will Reduce Wear and Permit Higher Speeds., Scheffel, H, Railway Gazette International, Vol. 132 No. 12, 453-456 pp, Dec. 1976

PERFORMING AGENCY: Standard Car Truck Company, Proj. No. 30000

INVESTIGATOR: Bullock, RL (Tel (312) 427-1466)

SPONSORING AGENCY: Standard Car Truck Company

In-House

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1973 COMPLETION DATE: Dec. 1977

### 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, Incorporated, Engineering Division

**INVESTIGATOR:** Jackson, KL

**SPONSORING AGENCY:** General Steel Industries, Incorporated, 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:** Agricultural Research Service, Department of Agriculture; Chicago, Milwaukee, St. Paul and Pacific Railroad

**RESPONSIBLE INDIVIDUAL:** Breakiron, PL

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** 1976 **COMPLETION DATE:** 1978 **TOTAL FUNDS:** \$60,000

**ACKNOWLEDGMENT:** Department of Agriculture

**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 099425.

**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:** Aug. 1977 **START DATE:** 1976

**ACKNOWLEDGMENT:** Association of American Railroads Technical Center

**03 159630**

### **FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 6. UTILIZATION IMPACTS OF FREIGHT CAR DESIGN AND SERVICEABILITY**

Evaluate the relationships between serviceability and freight car utilization. Analyze utilization costs associated with car purchase decisions based on initial purchase price alone. Standardization of car design will be investigated. Evaluate the utilization costs related to the rejecting of cars by shippers including the costs and benefits of different strategies of reduce the

number of expected bad-order cars. Conduct a study to quantify the benefits of cooperative repair programs by individual railroads.

**PERFORMING AGENCY:** Association of American Railroads

**SPONSORING AGENCY:** Federal Railroad Administration; Association of American Railroads

**RESPONSIBLE INDIVIDUAL:** Shamberger, RC (Tel (202)426-2920) Wooden, DG (Tel (202)293-5018)

92500

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1977 **COMPLETION DATE:** Sept. 1977 **TOTAL FUNDS:** \$92,500

**ACKNOWLEDGMENT:** AAR

**03 159632**

### **MAINTAINABILITY METHODOLOGY FOR THE EVALUATION OF ALTERNATIVE HIGH SPEED PASSENGER TRAIN TRUCKS**

This work is for the development of a maintainability model for use on advanced passenger trains capable of at least 125 MPH (200 KPH). Passenger train locomotives and powered and non-powered cars will be considered. The model is to include costs associated with all truck components, such as braking equipment, generators, suspension systems, structural elements and traction motors. Acquisition and utilization of design and maintenance data in an appropriate model to provide a methodology suitable for specifying and evaluating new passenger train trucks is the major thrust of this project. Early in the project, the simulation cost model (SCM) technique was identified as being the most appropriate technique to use. It calculates the cost per unit time needed to operate the component or system under consideration. Sensitivity analyses can be run and future cost and component or system usage projections can be made. Since the technique incorporates dynamic analysis, the effects of gradually introducing a new or improved component can be estimated.

**PERFORMING AGENCY:** Shaker Research Corporation

**INVESTIGATOR:** Krauter, AI (Tel (518)877-8581)

**SPONSORING AGENCY:** Transportation Systems Center

**RESPONSIBLE INDIVIDUAL:** Yearwood, KW (Tel (614)494-2046)

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** Dec. 1976 **TOTAL FUNDS:** \$70,806

**ACKNOWLEDGMENT:** TSC

**03 159633**

### **FABRICATE AND PACKAGE TWO ENGINEERING PROTOTYPE NON-DESTRUCTIVE RAILROAD ROLLER BEARING DIAGNOSTIC SYSTEMS**

The purpose of this contract is to develop two (2) non-destructive instrumentation systems for evaluation of diagnostic techniques. One system; a Railroad Roller Bearing Shock Emission Analyzer will be used to detect spalling and brinelling in roller bearings. The other system, a Pulse Echo Ultrasonic Lubrication Detector will determine the lubrication level in roller bearings. These systems should be capable of inspecting the bearings while they are on the wheel set.

**PERFORMING AGENCY:** SKF Industries, Incorporated

**INVESTIGATOR:** Allen, G (Tel (215)265-1900)

**SPONSORING AGENCY:** Transportation Systems Center

**RESPONSIBLE INDIVIDUAL:** Yearwood, KW (Tel (617)494-2046)

Contract DOT-TSC-1377

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1977 **TOTAL FUNDS:** \$161,643

**ACKNOWLEDGMENT:** TSC

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%. Verification of performance compared to conventional car will be accomplished by operation on the NYCTA subway lines.

PERFORMING AGENCY: AiResearch Manufacturing Company, Garrett Corporation; 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: Aug. 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, Jr (Tel (202) 426-9665)

PPA-RR-05

STATUS: Active NOTICE DATE: Aug. 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 059676

**INVERTER POWER SYSTEM FOR METROLINER**

The objective is to provide DOT/Transportation Systems Center (DOT/TSC) with test and evaluation results achieved by replacing motor-alternators with static inverters in two up-graded Metroliners.

PERFORMING AGENCY: Rohr Industries, Incorporated  
SPONSORING AGENCY: Transportation Systems Center, R6351

Contract DOT-TSC-1284 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$392,172

ACKNOWLEDGMENT: TRAIS (R6351)

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 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 &amp; 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 & Communic, Can

INVESTIGATOR: Soots, V Palm-Leis, A

SPONSORING AGENCY: Ontario Ministry of Transportation &amp; Communic, Can

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 159663**

### WAYSIDE ENERGY STORAGE SYSTEM (WESS)

Feasibility study assessing energy storage concepts for wayside application on long downgrades in railroad freight operations. Technical/engineering economic assessment will include location sites, integrated system concepts or flywheel stations and locomotives, power and energy requirements, locomotive modifications, wayside third rail and/or catenary, flywheel station hardware concepts, control system analysis, energy supplement concepts, interface with electrified railroads, economic viability and cost sensitivity, and recommendations for suitable follow-on work.

**PERFORMING AGENCY:** AiResearch Manufacturing Company, Garrett Corporation  
**INVESTIGATOR:** Lawson, J (Tel (213)323-9500) Shapiro, H  
**SPONSORING AGENCY:** Transportation Systems Center; Federal Railroad Administration, Office of Research Development  
**RESPONSIBLE INDIVIDUAL:** Koper, JK (Tel (202)426-0808)

Contract DOT-TSC-1349

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** May 1977 **COMPLETION DATE:** July 1978 **TOTAL FUNDS:** \$250,000

**ACKNOWLEDGMENT:** FRA

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 (417)494-2651)

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: June 1975

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 Research and Development Center, Department of Transport, Canada  
 RESPONSIBLE INDIVIDUAL: Sutliff, DR (Tel (312) 225-9600 X-146)

STATUS: Active NOTICE DATE: Aug. 1977 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) 494-2651)

Contract DOT-TSC-1298

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$44,900

ACKNOWLEDGMENT: TSC

05 157901

**BRAKING AND COUPLING SYSTEMS PERFORMANCE OPTIMIZATION PROGRAM**

This multi-year program will begin in FY-78 with the award of two one-year contracts as follow-on investigations to the technology assessments performed previously. Topics being considered are: the effects of friction shoe materials on wheel profile; control of train action forces through optimization of train line valving and plumbing; electropneumatic braking; configuration economics; load sensing devices; and automatic coupler design.

Contracts to specific performing agencies not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Fay, GR Federal Railroad Administration (Tel (202)426-0855)

STATUS: Proposed NOTICE DATE: July 1977 COMPLETION DATE: Dec. 1978

ACKNOWLEDGMENT: FRA

05 159634

**DESIGN AND FABRICATION OF A WAYSIDE BRAKE INSPECTION SYSTEM FOR RAILROAD VEHICLES**

This contract is for the development of a brake inspection system. It is expected that the system will be able to determine the braking performance of freight cars in a dynamic mode as a train passes through the wayside system. Two techniques are to be integrated into the total system. Infrared measurement of the wheels will be used to provide a qualitative measurement of the energy input to the wheels. The second technique will use a short instrumented "reaction rail" section spliced into one rail to give a quantitative indication of the retarding force of the wheels.

PERFORMING AGENCY: Novatek Incorporated  
 INVESTIGATOR: Spaulding, D (Tel (617)272-6230)  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Yearwood, KW (Tel (617)494-2046)

Contract DOT-TSC-1323

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1977 COMPLETION DATE: June 1978 TOTAL FUNDS: \$62,674

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 Research and Development Center, Department of Transport, Canada  
 RESPONSIBLE INDIVIDUAL: Rudback, NE (Tel 514-283-4077)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Feb. 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$184,670

ACKNOWLEDGMENT: Transportation Research and Development Center

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: Aug. 1977 START DATE: July 1975

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

06 159655

**RAILROAD ELECTROMAGNETIC COMPATIBILITY: A SURVEY AND ASSESSMENT**

The objectives of this study are to identify and evaluate the electromagnetic relationships between various systems (power, control, communication) in the classification yard and to investigate the impact from electrification on communication and signal equipment and the environment. The results of this evaluations will provide for a more compatible electromagnetic environment. The project will include a literature search, analysis and testing. Recommendations will be made for follow-on research, as appropriate.

**REFERENCES:**

Res Plan EMC Study of the Communications and Control Systems in a Railroad Classification Yard, Electromagnetic Compatibility Analysis Center, FRA/ORD-77/44, July 1977

PERFORMING AGENCY: Electromagnetic Compatibility Analysis Center  
 INVESTIGATOR: Safferman, S (Tel (301)267-2224) Speh, P  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr (Tel (202)426-0855)

IA AR74311

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$140,000

ACKNOWLEDGMENT: FRA

06 159656

**RAILROAD CLASSIFICATION YARD TECHNOLOGY: NEW CONCEPTS AND ADVANCED TECHNOLOGY IN FREIGHT CAR SPEED CONTROL**

The objective of this study is to select only the most promising car speed control concepts and technology and recommend them as candidates for yard integration and test demonstration. The most promising concepts and technology are to be selected on the basis of cost effectiveness, technical suitability and likelihood for near term (ten years or less) application in

upgraded or new U.S. yards. The project will assess the advances in the state-of-the-art. The project will result in a recommended plan for yard integration and tests of the most promising concepts and advanced technology.

Contract to a performing agency has not yet been awarded.

SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr (Tel (202)426-0855)

STATUS: Proposed NOTICE DATE: Aug. 1977 START DATE: Feb. 1977  
COMPLETION DATE: Dec. 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: FRA

06 159657

**RAILROAD CAR PRESENCE DETECTION DEVICES**

The objective of this study is to develop a performance specification for car presence detection devices. The project will assess the function and requirements for the device and evaluate the performance of present day devices. The effort will identify and evaluate causes of device failures and collect reliable data on performance. Engineering cost elements will be identified and an analysis of trade-offs between performance and cost.

Contract to a performing agency has not yet been awarded.

SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr (Tel (202)426-0855)

STATUS: Proposed NOTICE DATE: Aug. 1977 START DATE: Mar. 1977  
COMPLETION DATE: Nov. 1978 TOTAL FUNDS: \$210,000

ACKNOWLEDGMENT: FRA

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, DB

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Levine, D (Tel (202) 426-1227)

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

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) 472-7280)

Contract AR-64216

STATUS: Completed NOTICE DATE: Aug. 1977

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: Aug. 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.

PERFORMING AGENCY: University Research Corporation

INVESTIGATOR: Mannelo, T (Tel (301) 524-3936)

SPONSORING AGENCY: Federal Railroad Administration; Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Collins, DM (Tel (202) 472-7280)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977 COMPLETION DATE: Jan. 1979

ACKNOWLEDGMENT: FRA

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: Hopkins, JB (Tel (617)494-2023)

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Levine, D (Tel 202-426-1227)

STATUS: Active NOTICE DATE: Aug. 1977

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 improvement 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: Aug. 1977 START DATE: Apr. 1975 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$122,180

ACKNOWLEDGMENT: TRAIS (RR-502), FRA

08 135156

**GRADE CROSSING PASSIVE SIGNING/MARKING EFFECTIVENESS STUDY**

This study evaluated the effectiveness of seven new passive signing configurations to warn drivers of the potential hazards at railroad grade crossings. "Before" and "After" experiments were conducted at 24 crossings in 16 of the 25 participating states. The new signing configurations were found to increase driver awareness at the crossings but did not change vehicle speed characteristics. Recommendations were made to change the existing signing configuration to the most effective configuration studied.

**REFERENCES:**

Railroad Grade Crossing Passive Signing Study. Interim Report, Koziol, JS; Mengert, PH, DOT-TSC-FHWA-76-1 7701

Railroad Grade Crossing Passive Signing Study Coleman, J; Koziol, JS; and Mengert, PH, Public Roads, Vol. 40, 4, Mar. 1977

PERFORMING AGENCY: Transportation Systems Center

INVESTIGATOR: Koziol, JS (Tel (617)494-2014) Mengert, PH

SPONSORING AGENCY: Federal Highway Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Byington, SR

IA HW-611

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: Oct. 1974 COMPLETION DATE: July 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

08 159644

**COMPUTER SIMULATION OF DERAILMENT IN RAILWAY GRADE CROSSING COLLISIONS**

Development of a digital computer program to analyze the collision of road and rail vehicles at grade crossings and a sensitivity analysis of the effect on rail vehicle derailment by several variables.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 8.35.77

INVESTIGATOR: Churchas, D

SPONSORING AGENCY: Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Churchas, D

Contract OST77-00021

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1977 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$58,000

ACKNOWLEDGMENT: Queen's University, Canada

08 159654

**GRADE CROSSING SAFETY**

Development of reliable and intelligent train detection, constant warning time devices, off-track train detection and warning devices, active advance warning signals and an analysis of the economic liability problem.

PERFORMING AGENCY: Traffic Systems Center, Office of the Secretary of Transportation

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation; Federal Highway Administration

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1977 TOTAL FUNDS: \$800,000

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, DM (Tel (202)426-1227)

AR-40008

STATUS: Active NOTICE DATE: Aug. 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 059688

**TRANSFORMER COOLANT REPLACEMENT FOR POLYCHLORINATED BIPHENYLS**

The objective is to evaluate a potential replacement material for the Polychlorinated Biphenyls (PCBs) coolant presently used in transformers by the railroad industry. The replacement fluid shall function as a coolant for new railroad transformers as well as a replacement for the PCBs in the transformers already in railroad service.

PERFORMING AGENCY: General Electric Co.

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6351

Contract DOT-TSC-1293 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$74,092

ACKNOWLEDGMENT: TRAIS (R6351)

09 059690

**TRANSFORMER COOLANT REPLACEMENT FOR POLYCHLORINATED BIPHENYLS (PCBS)**

The objective is to evaluate a potential replacement material for the Polychlorinated Biphenyls coolant presently used in transformers by the railroad industry. The replacement fluid shall function as a coolant for new railroad transformers as well as a replacement for the PCBs in the transformers already in railroad service.

PERFORMING AGENCY: Westinghouse Electric Corporation

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

Contract DOT-TSC-1294 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$99,938

ACKNOWLEDGMENT: TRAIS

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 ALLOYS TO 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: Waterways Experiment Station, 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: Aug. 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: Aug. 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)494-2457)

Contract DOT-TSC-1076  
STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Oct. 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: Aug. 1977 TOTAL FUNDS: \$125,000

ACKNOWLEDGMENT: DOT

**09 152653**  
**CONTROL OF BIODETERIORATIONS OF WOOD STRUCTURES IN MARINE ENVIRONMENTS**

To develop effective means for the control of biodeterioration of Navy wood structures located in marine environments. Isolate the microorganisms present in treated test wood panels which have been exposed in the ocean to determine their role in premature failure of treated pilings. Determine the effectiveness of various on-site preservative treatments for exterior millwork, decks, and piles by field tests. Determine what combination of preservative type, quality and quantity is the most effective and economical for use in the dual treatment to protect wood against marine borers in warmwater harbors. Study the effect of pretreatment molding of southern pine upon the permanence of treatment. Conduct field trials of a new attractant insecticide bait method to control the formosan termite.

PERFORMING AGENCY: Wisconsin University, Milwaukee, Forest Products Laboratory  
INVESTIGATOR: Eslin, WE Clark, JW  
SPONSORING AGENCY: Naval Facilities Engineering Command, Department of the Navy, DN144303

STATUS: Active NOTICE DATE: Nov. 1976 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GQN144303 1)



**10 058132****PROGRAM FOR LOCOMOTIVE AND MARINE DIESEL ENGINE PERFORMANCE AND EMISSIONS**

To improve engine efficiency and reduce emissions from large medium speed diesels. Methods include the use of waste lube oil, determining ship duty cycle, optionization of prop/pitch loading, development of engine diagnostics, and the use of water-in-fuel emulsions.

**REFERENCES:**

A Study of Fuel Economy Emission Reduced Methods for Marine and Locomotive Diesel Engines, Storment, J, Sept. 1975

Waste Oil Burn-off in CG Powerplants Storment, J, July 1976

Use of water-in-fuel-Emulsions in a Single Cylinder Diesel Engine, Storment, J

PERFORMING AGENCY: Southwest Research Institute

INVESTIGATOR: Storment, J (Tel (512)684-5111x2643)

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, CG-407; United States Coast Guard

RESPONSIBLE INDIVIDUAL: Mason, RL (Tel (617)494-2514)

Contract DOT-TSC-920

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Nov. 1974 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$400,000

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 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.

**REFERENCES:**

In-Service Performance and Costs of Methods for Control of Urban Rail System Noise Experimental Design, Holowaty, M; Saurenman, H; Rosen, S, UMTA-MA-06-0025-76-4 Intrm Rpt, May 1976

In-Service Performance and Costs of Methods to Control Urban Rail System Noise Test and Eval Plan, Saurenman, H; Holowaty, M, UMTA-MA-06-0025-7710 Intrm Rpt, Apr. 1977

PERFORMING AGENCY: De Leuw, Cather and Company

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, UM-504

RESPONSIBLE INDIVIDUAL: Lotz, R (Tel (617) 494-2142)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$425,357

ACKNOWLEDGMENT: TRAIS (UM-504)

**10 059682****DATA ANALYSIS ON LOCOMOTIVE NOISE**

The objective is to simplify noise source diagnostic procedures and overall noise level testing procedures to facilitate the large scale assessment of locomotive noise.

PERFORMING AGENCY: Bolt, Beranek and Newman, Incorporated

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6513

Contract DOT-TSC-1304 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$16,991

ACKNOWLEDGMENT: TRAIS (R6513)

**10 059730****STUDY ON NOISE EMANATING FROM HIGHWAYS AND RAILROADS**

The objective is to study the highway and railroad noise measurement data obtained by TSC, and to provide TSC with engineering analytical, interpretive, and design information based on this data, which will further knowledge of acoustic propagation and improve the prediction and abatement of noise from highway and railroad operations and rights-of-way.

PERFORMING AGENCY: Sonatech, Incorporated

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6513/R6513T

Contract TSC-1287 (FFP)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$24,875

ACKNOWLEDGMENT: TRAIS (R6513/R6513T)

**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  
 RESPONSIBLE INDIVIDUAL: Cooper, NL

STATUS: Active NOTICE DATE: Aug. 1976 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: DOT

**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. PROGRESS REPORT: Data are being collected on bin pressure for the second year in the prototype storage bin bulk pile. The storage bin is 24 feet wide, 80 feet long and has a pile depth of 17 1/2 feet. Depth of pile, width of the storage bin, friction coefficients, and length of time in storage are considered the major parameters which affect pile pressure. These data are being manually monitored daily. Other factors such as humidity and temperature or rapid changes in these conditions are also being recorded. Vibration caused by passing trains and its effect on potato bin pressure has been preliminarily investigated, however because additional recording instruments are needed to investigate this parameter in detail, no data are being collected. Friction coefficients for three varieties of potatoes on several building materials are being investigated. The materials are plywood, corrugated sheet metal, smooth sheet steel, smooth and rough concrete, and polyethylene film.

**REFERENCES:**

Lateral and Vertical Pressures on Potato Storage Yaeger, EC, M.S. Thesis, May 1976

PERFORMING AGENCY: Agricultural Research Service, Department of Agriculture, 3506-15630-006

INVESTIGATOR: Yaeger, EC Schaper, LA

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Completed NOTICE DATE: Aug. 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 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 & Communication

INVESTIGATOR: Curmi, RA (Tel (416)248-3771)

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication

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 & Communication, Can

10 148349

**ADDITIONAL RAIL RAPID TRANSIT NOISE STUDIES BASED ON 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 measure noise levels in or near selected cars or trackage on a periodic basis. A review of maintenance records of the selected cars will be accomplished during the study period. Car Maintenance Records on selected cars will be used to analyse 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: Kurzweil, L (Tel (617) 494-2142)

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 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, Jr (Tel (202) 426-9564)

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: Apr. 1979

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: Completed NOTICE DATE: Aug. 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 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: Pat, NG (Tel (617)494-2237)

Contract DOT-TSC-994 (CPFF)

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: Mar. 1975 TOTAL FUNDS: \$21,000

ACKNOWLEDGMENT: Pittsburgh University, Washington, D.C.

11 059365

**ANALYSIS OF THE MORGANTOWN INDUCTIVE COMMUNICATION SYSTEM DESIGN**

Provide a report documenting the Morgantown Inductive Communication System Design. The report shall contain the following elements: a) Provide a general description of the MPRT System and its operation including a description of the Control and Communications System; b) Describe the system level design requirements and the resulting design, analysis and development test program undertaken to meet and validate these requirements as well as the rationale that led to the selection of the communication techniques implemented in the MPRT System; c) Describe the significant analysis and test results obtained, with emphasis on the major problem areas encountered at Morgantown and the solutions to these problems; d) Provide a detailed description of efforts made to develop a guideway analytical model, any validation tests performed and known limitations of work done to date. Define areas which must be expanded or validated to develop a useful guideway model; 3) Define specific problems based on experience with the Morgantown System.

PERFORMING AGENCY: Boeing Company, Aerospace Group, DOT-TSC-1275  
 INVESTIGATOR: Johnstone, T (Tel (206)773-1828)  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6782  
 RESPONSIBLE INDIVIDUAL: Yoh, P Transportation Systems Center (Tel (617)494-2271)

Contract DOT-TSC-1275 (CPF)  
 STATUS: Active NOTICE DATE: July 1977 START DATE: Sept. 1976 COMPLETION DATE: July 1978 TOTAL FUNDS: \$21,525

ACKNOWLEDGMENT: TRAIS (R6782)

#### 11 059376

**STUDY OF PERSONAL RAPID TRANSIT FOR THE AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM**  
 Objectives of the Automated Guideway Transit Technology Program are to: (1) Develop estimates of the cost, service, reliability and safety performance of AGT Systems; (2) generate performance specifications for future AGT engineering development programs; (3) synthesize guideline standards for AGT systems including safety and reliability; and identify technology shortfalls that impede the implementation of viable AGT systems.

PERFORMING AGENCY: Aerospace Corporation  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, CA-06-0091

Contract DOT-UT-60052T (CPFF)  
 STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Sept. 1976 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$1,761,650

ACKNOWLEDGMENT: TRAIS (CA-06-0091)

#### 11 059380

##### **SYSTEMS OPERATION STUDIES FOR AUTOMATED GUIDEWAY TRANSIT SYSTEMS**

No Abstract.

PERFORMING AGENCY: General Motors Corporation  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6709  
 RESPONSIBLE INDIVIDUAL: Marino, JJ (Tel (617)494-2000)

Contract DOT-TSC-1220 (CPF)  
 STATUS: Active NOTICE DATE: Jan. 1977 START DATE: June 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$2,187,000

ACKNOWLEDGMENT: TRAIS (R6709)

#### 11 059421

##### **LINEAR INDUCTION MOTOR RESEARCH VEHICLE (LIMRV) TEST PROGRAM**

The primary object of this test program is to obtain essential test data on linear induction motors and on truck/rail dynamics, as well as correlation of this data with theory and mathematical models. The LIMRV is considered an important testbed because of its unique instrumentation and speed range. The LIMRV has established a world speed record for steel-wheel on steel-rail vehicles of 411.5 Km/h.

PERFORMING AGENCY: AiResearch Manufacturing Company, Garrett Corporation  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Guarino, M, Jr (Tel (202)426-9665)

Contract DOT-FR-64226 (CPFF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: Jan. 1979 TOTAL FUNDS: \$1,210,000

ACKNOWLEDGMENT: TRAIS

#### 11 059696

##### **AGT AVAILABILITY GUIDELINES**

The objective is to develop and examine various definitions and expressions for the service availability of automated guideway transit systems and to develop a set of guidelines that will present the definitions along with their applicability and use.

PERFORMING AGENCY: Battelle Columbus Laboratories  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6709  
 RESPONSIBLE INDIVIDUAL: Marino, JJ (Tel (617)494-2000)

Contract DOT-TSC-1283 (CPF)  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$97,366

ACKNOWLEDGMENT: TRAIS (R6709)

#### 11 059922

##### **INVESTIGATION OF VEHICLE-SUSPENSION GUIDEWAY DYNAMIC INTERACTIONS FOR URBAN TRANSIT**

The project on the investigation of vehicle-suspension guideway dynamic interactions for automated rail transit will be composed of two major tasks: 1) extend previously developed techniques to achieve design programs for multi-vehicle guideway systems. The use of multiple spans is likely to reduce guideway cross-sectional requirements and minimize thermally induced deflections thus reducing guideway costs; 2) conceptually design and evaluate practical limitations for lateral AGT vehicle steering. This work will provide a reference of optimum performance against which to measure the performance of any real steering system, and a series of practical steering systems which could be implemented in practice.

PERFORMING AGENCY: Massachusetts Institute of Technology  
 INVESTIGATOR: Richardson, HH  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, MA-11-0003  
 RESPONSIBLE INDIVIDUAL: Izumi, G (Tel (202)426-8483)

Grant DOT-MA-11-0003  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$71,450

ACKNOWLEDGMENT: TRAIS (MA-11-0003)

#### 11 059924

##### **MULTI-DISCIPLINARY STUDY OF THE USE OF TRAINS OR PLATOONS OF VEHICLES FOR URBAN AUTOMATED GUIDEWAY TRANSPORTATION (AGT)**

The project undertakes research on the use of trains or platoons of vehicles in combination with individual small vehicles for urban automated transportation. The multi-disciplined study will undertake two tasks: 1) System Operations-Relate the technological characteristics of the trained AGT systems to the potential economic and service advantages these systems offer. 2) Vehicle Control- Investigate vehicle control configurations. Determine what kind of vehicle control system will permit operations at the highest capacity level. Derive and justify the safety assumptions and synthesize and simulate the controller configuration. Conduct a single-vehicle/train capacity analysis.

PERFORMING AGENCY: Massachusetts Institute of Technology  
 INVESTIGATOR: Shladover, S  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, MA-11-0029  
 RESPONSIBLE INDIVIDUAL: Tucker, L (Tel (202) 426-9264)

Grant DOT-MA-11-0029  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$22,000

ACKNOWLEDGMENT: TRAIS (MA-11-0029)

#### 11 059925

##### **RESEARCH ON LONGITUDINAL CONTROL AND CRASHWORTHY VEHICLE DESIGN FOR AUTOMATED GUIDEWAY TRANSIT (AGT) SYSTEMS**

The project includes seven tasks: 1) study of vehicle-follower control by examining the behavior of strings of vehicles during various conditions; 2) study design of point follower control systems; 3) examine sensors to evaluate their suitability for use in AGT systems; 4) determine trade-offs between vehicle-follower and point-follower control concepts; 5) develop mathematical models and evaluate passenger protection systems for oblique collisions; 6) evaluate use of non-conventional braking systems; and 7) explore the safety and control problems associated with the use of AGT vehicles.

PERFORMING AGENCY: Minnesota University, Minneapolis  
 INVESTIGATOR: Garrard, WL  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, MN-11-0002  
 RESPONSIBLE INDIVIDUAL: Hoyler, RC (Tel (202) 426-9264)

Grant DOT-MN-11-0002  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$25,580

ACKNOWLEDGMENT: TRAIS (MN-11-0002)

#### 11 099412

##### LINEAR INDUCTION MOTOR COMPARATIVE ANALYSIS

Considerable interest has been shown in the application of linear induction motors for the propulsion of transportation vehicles. Despite the fact that a number of linear induction motors have been constructed in different countries the theory of their operation is not yet completely understood. Among the problems which require particular attention are end effects and the use of compensation windings to improve motor performance. This project has been directed toward a fundamental mathematical analysis of the linear induction motor. A quasi-two-dimensional model has been developed and a computer program (MOCOP) has been produced for evaluation of different linear induction motor designs. THE MOCOP program includes provision for study of LIM end effects; the influence of a finite width motor secondary; the effect of compensating windings for both a constant current and a constant voltage motor control. Calculated values of LIM performance have been compared with experimental results obtained on a 1.7 meter diameter LIM test wheel located at Ecole Polytechnique. In addition comparisons have been made between theory and practice for the Spar Aerospace Limited TLM 106 linear motor operating on the Spar linear test track facility. Good accord was obtained between theoretical predictions and test results.

Report issued: Etude theorique et comparaison experimentale de moteurs lineaire a inductions compensees, (Theoretical studies and experimental comparisons of the linear induction motor), l'Ecole Polytechnique de Montreal, February 1977.

PERFORMING AGENCY: Centre de Recherches des Transports, Montreal University  
 INVESTIGATOR: Mukhedkar, D (Tel (513) 343-7575)  
 SPONSORING AGENCY: Transportation Research and Development Center, Department of Transport, Canada  
 RESPONSIBLE INDIVIDUAL: Rudback, NE (Tel (514) 283-4077)

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: Dec. 1974 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$20,000

ACKNOWLEDGMENT: Transportation Research and Development Center

#### 11 110862

##### RESEARCH AND DEVELOPMENT WORK CONCERNING ELECTRODYNAMIC MAGNETIC LEVITATION-PHASE III

A feasible Maglev system based on electrodynamic levitation and linear synchronous motor propulsion for high speed ground transportation in the Canadian corridor has been identified. Mathematical models describing the levitation, guidance, propulsion, stability and dynamic performance of the vehicle have been developed. Large-scale tests of electrodynamic suspension and LSM propulsion have shown very good agreement with analysis. A design study of the superconducting magnets and isochoric dewar system has been conducted.

##### 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 Maglev Group, Phase II, 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

Superconducting Linear Synchronous Motor Propulsion and Magnetic

Levitation for High Speed Guided Ground Transp, Canadian Maglev Group, CIGGT Rpt 76-7, Phase III, Mar. 1976

Electrodynamic Suspension & Linear Synch Motor Prop for High Speed Guided Ground Transp, Canadian Maglev Group, Report to be published 7709

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, TDA07

INVESTIGATOR: Atherton, DL (Tel (613) 547-3015) Eastham, EA Slemmon, G Belanger, PR Dawson, GE Burke, PE Ooi, BT Silvester, P

SPONSORING AGENCY: Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Audette, M (Tel (514) 283-2880)

Contract OST-5-0112

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$480,000

ACKNOWLEDGMENT: CIGGT

#### 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.

##### 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 Research and Development Center, Department of Transport, Canada  
 RESPONSIBLE INDIVIDUAL: Gilbert, IF (Tel (514)283-5071)

Contract TDA-OSU76-00165  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1970 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$500,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (SJ 632)

#### 11 135604 COMMAND AND CONTROL SYSTEMS FOR ADVANCED TRANSPORTATION SYSTEMS

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: Aug. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AQ 881 2)

#### 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. Present system is being expanded under an UMTA Capital Grant of \$63.5M to the West Virginia Board of Regents from 3 stations, 5.4 miles single lane guideway, and 45 vehicles to 5 stations, 8.4 miles single lane guideway, and 73 vehicles. An Additional maintenance facility, a heated power rail, and other technical improvements will also be added.

#### REFERENCES:

Morgantown PRT System Boeing Aerospace Company, Nov. 1975  
 PRT Impact Study (Pre-PRT Phase) Elias, SEG, Mar. 1976  
 Morgantown PRT Operation & Maintenance History Stone, AL, Boeing Aerospace Company, Jan. 1977  
 Morgantown PRT Impact Evaluation. Interim Analysis Of Ridership, Stearns, M; Schaeffer, K, Mar. 1977

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: Aug. 1977 START DATE: 1970 COMPLETION DATE: Sept. 1979 TOTAL FUNDS: \$60,000,000

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 interurban 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: Aug. 1977 START DATE: June 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$409,362

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, JF (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: Aug. 1977 START DATE: July 1976 COMPLETION DATE: July 1978 TOTAL FUNDS: \$111,000

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: Aug. 1977 START DATE: Sept. 1976 COMPLETION DATE: Sept. 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: Aug. 1977 START DATE: June 1976 COMPLETION DATE: June 1979 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: DOT

#### 11 149463

##### SYNCHRONOUSLY OPERATING LINEAR ELECTRIC MOTORS FOR GROUND TRANSPORTATION

To conduct studies, primarily analytical, of certain aspects of linear synchronous motor operation and design. To review work of General Electric, done under a related contract, on the design of linear synchronous motors, and on the construction and testing of a small scale model of such machines.

##### REFERENCES:

Preliminary Method for Design of a Linear Synchronous Motor, Inductor Type, Levi, E, Jan. 1977

PERFORMING AGENCY: Polytechnic Institute of New York, Department of Transportation Planning & Engineering, PR-4227

INVESTIGATOR: Levi, E (Tel (212)643-4486) Birenbaum, L Zabar, Z

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Guarino, M, Jr (Tel (202)426-9665)

Contract DOT-FR-64227

STATUS: Active NOTICE DATE: May 1977 START DATE: Sept. 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$255,360

238

#### 11 152650

##### ANALYSIS OF SEGMENTED LINEAR RELUCTANCE MOTORS

Over the last decade, linear induction and synchronous motors have been studied at length, especially with regard to their possible application for ground transportation. In addition, a conventional type of linear reluctance motor, having a notched ferromagnetic secondary rail has also been investigated. The principal objective of this research is to study the linear reluctance motor having a segmented secondary. It is proposed to investigate new phenomena, such as end-effects and traverse-edge effects stemming from a topographic change from a cylindrical structure to a flat one. This, in turn, is expected to yield a realistic mathematical model of the reluctance motor leading to its design, development, and feasibility for various applications. It is proposed to design and construct a laboratory model to test the validity of the mathematical model.

PERFORMING AGENCY: Kentucky University, Department of Electrical Engineering

INVESTIGATOR: Nasar, SA

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG75-17366

STATUS: Active NOTICE DATE: Dec. 1976 START DATE: July 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$26,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5562 1)

#### 11 159637

##### FEASIBILITY STUDY OF AN INTEGRATED SUSPENSION-PROPULSION SYSTEM FOR A TRACKED MAGNETICALLY LEVITATED VEHICLE

An experimental evaluation (and analysis at the Mitre Corp.) is planned to evaluate a SSLIM for an integrated suspension-propulsion system for guided ground transport. A bar-type reaction rail will be mounted on a 0-101 km/h 7.7 m diameter test wheel, and the 1.73 m long 6 pole stator will be mounted in a six-component force balance and energized by a 200 kVA PWM inverter. Tests will be conducted over a wide range of operating conditions and parameters will be monitored, processed and stored by means of a data acquisition/minicomputer system.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 6A 66.76; Mitre Corporation

INVESTIGATOR: Eastham, AR (Tel (613)547-5759) Dawson, GE Ather-ton, DL

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Katz, RM (Tel (703)790-6000)

Contract DOT-UT-50016

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1977 COMPLETION DATE: May 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: CIGGT

#### 11 159643

##### MAGLEV LINEAR SYNCHRONOUS MOTOR MODEL

The research investigation into the linear synchronous motor for non-contact propulsion of passenger vehicles is both experimental and theoretical. The research activity consists of the development of theoretical performance and control concepts, the implementation and comparison of theoretical results with results obtained from the already established model facility and the bringing together of theoretical and experimental results to suggest the requirements for implementation on a full size system. This research program is part of the Canadian Maglev Program which is investigating superconducting linear synchronous motor propulsion and magnetic levitation for high speed guided ground transportation.

##### REFERENCES:

Linear Synchronous Motor Feedback Controls Dawson, EG; Sen, PC; Clarke, DG; Lakhavani, S, IEEE Trans on Magnetics, VMAG12,N6, pp885-888, Nov. 1976

A Device to Measure Force Angle of a Linear Synchronous Motor, Dawson, EG; Schwalm, L; Unteregelsbacher, E, IEEE Trans on Indus Elec and Control Instrum, VIECI23, N4, pp 406-09, Nov. 1976

Superconducting Mag Levitation & Linear Synchronous Motor Propulsion for High-Speed Guided Ground Transp, Ministry of Transport, CI GGT, No. 76-7, Mar. 1976

Superconducting Mag Levitation & Linear Synchronous Motor Propulsion for High Speed Guided Ground Transp, Ministry of Transport CIGGT, No.

75-5, Mar. 1975

Interim Report on Linear Synchronous Motor Experimental Model, Dawson, GE; John, VI; Sen, PC; Bennett, JA; Clarke, S, CIGGT, No. 74-7, Aug. 1974

Department of Characteristics of Variable Speed Linear Synchronous Motor, Dawson, Ge; John, VI, CIGGT, No. 7406, Aug. 1974

Analysis & Appl of Superconducting May Lev & Linear Synchro Motor Propul to High Speed Guided Ground Transp, Ministry of Transport, Mar. 1974

Linear Synchronous Machine: Transient Analysis and Control Lakhavani, S, Queen's University, Elec Engineering Dept, Ms Thesis

Cycloconverter Control of Linear Synchronous Motor Clarke, D, Queen's University, Elec Engineering Dept, MS Thesis

PERFORMING AGENCY: Queen's University, Canada, Department of Electrical Engineering, 6/18/74

INVESTIGATOR: Dawson, GE (Tel (613)547-2684) Sen, PC (Tel (613) 547-2684)

SPONSORING AGENCY: Transportation Research and Development Center, Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: Audette, M

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1972 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$45,080

ACKNOWLEDGMENT: Queen's University, Canada

11 159658

**AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM, SYSTEM, SAFETY AND PASSENGER SECURITY PROJECT**

The objectives of the project are to 1. Generate guidance and planning information on system and passenger security. 2. Develop a model based on system features to predict passenger perceptions of system safety and security. 3. Provide standard deceleration and seating specs to assure passenger safety during emergency stops in AGT systems. 5. Specification of seating and slope. 6. Passenger Security and Vandalism. 7. Passenger Safety and Convenience. 8. Passenger Evacuation and Rescue. 9. Dissemination of information through guidebooks and user workshops.

PERFORMING AGENCY: Dunlap and Associates, Incorporated

INVESTIGATOR: Pepler, RD (Tel (202)655-3971)

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Sussman, ED (Tel (617)494-2041)

Contract DOT-TSC-1314

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1977 COMPLETION DATE: Jan. 1979 TOTAL FUNDS: \$588,000

ACKNOWLEDGMENT: UMTA

11 159659

**AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM, VEHICLE LATERAL CONTROL AND SWITCHING (VLACS) PROJECT**

The VLACS project will develop AGT vehicle lateral control and switching concepts that (1) reduce cost, weight, and complexity, (2) improve performance (ride quality), life, reliability, and increase switching capability. The VLACS project provides for an experimental program to validate and evaluate the analytical design studies. Both contact (mechanical) and non-contact (wire follower) lateral control systems will be evaluated. To aid government officials, transit planners and system manufacturers, the VLACS project will develop lateral control and switching system guideline specifications and data base of the current technology.

Contract to a performing organization has not yet been awarded.

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Izumi, G (Tel (202)426-4048)

Contract DOT-UT-70088

STATUS: Proposed NOTICE DATE: Aug. 1977 START DATE: Aug. 1977 COMPLETION DATE: Aug. 1979 TOTAL FUNDS: \$900,000

ACKNOWLEDGMENT: UMTA

11 159660

**AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM, VEHICLE LONGITUDINAL CONTROL AND RELIABILITY**

Reduce cost and complexity and increase reliability of Longitudinal Control Systems through the following steps: (1) Technology Evaluation and Model Development; (2) Vehicle Longitudinal Control Studies; (3) Reliability Enhancement Studies; (4) Entrainment and Platooning Studies; (5) Experimental Program; (6) Data Base Development and Guidelines Specification and Requirements.

PERFORMING AGENCY: Otis Elevator Company, Transportation Technology Division

INVESTIGATOR: Schumacher, PJ (Tel (303)343-8780)

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Hoyler, RC (Tel (202)426-8483)

Contract DOT-UT-70048

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1977 COMPLETION DATE: Sept. 1979 TOTAL FUNDS: \$2,562,000

ACKNOWLEDGMENT: UMTA

11 159661

**AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM GUIDEWAY AND STATION**

The GST project will develop/establish guideway and station concepts that: (1) reduce construction, installation, operating and maintenance costs, (2) improve site integration and aesthetics, and (3) improve all weather operation and power distribution. To aid system manufacturers, governmental officials and transit planners the GST project will develop AGT guideway station design guidelines and requirements, computer based cost and implementation time models and a data base on AGT guideway and station technology. The project is expected to require 25 months.

PERFORMING AGENCY: De Leuw, Cather and Company

INVESTIGATOR: Stevens, R (Tel (312)346-0424)

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Izumi, G (Tel (202)426-4048)

Contract DOT-UT-70066

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1977 COMPLETION DATE: Aug. 1979 TOTAL FUNDS: \$999,865

ACKNOWLEDGMENT: UMTA

11 159662

**AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY. SYSTEMS OPERATION STUDY**

The objectives of the System Operation Study are to evaluate the applicability of AGT systems to alternative application areas as well as to make AGT computer analysis tools available to AGT systems and investigate the operational characteristics of automated guideway transit systems in network configurations such as simple shuttles or loop, line haul networks and complex or area-wide networks.

PERFORMING AGENCY: General Motors Corporation, Transportation Systems Division

INVESTIGATOR: Thompson, J (Tel (313)575-8485)

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Tucker, HL (Tel (202)426-9264)

Contract DOT-TSC-1220

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1976 TOTAL FUNDS: \$3,200,000

ACKNOWLEDGMENT: UMTA

12 048924

**STUDY OF CURRENT STATUS OF TRANSPORTATION SAFETY RESEARCH AND DEVELOPMENT**

The objective of this task was 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 were 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.

PERFORMING AGENCY: Science Management Corporation, Decision Studies Group

INVESTIGATOR: Suto, P

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Smith, RT (Tel (617)494-2750)

Contract DOT-TSC-860 (CPFF)

STATUS: Terminated NOTICE DATE: 7708 START DATE: June 1974

ACKNOWLEDGMENT: TRAIS (PR# SP-0063 & A), OST

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 reseal 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, DM (Tel (202)426-1227)

STATUS: Completed NOTICE DATE: Aug. 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: Aug. 1977 START DATE: June 1974 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$88,860

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, Aeronautics and Space Technology Office, NASA

INVESTIGATOR: Mansfield, J (Tel 415-965-5991)

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, DM (Tel (202)426-1227)

AR-30033

STATUS: Active NOTICE DATE: Aug. 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: Aug. 1977 START DATE: Feb. 1974 COMPLETION DATE: Apr. 1978

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 fatalities by mode incorporating contractor-identified forecasted inputs from TSC such as projected vehicle miles of travel, load factors, passenger miles of travel, 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: Aug. 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 & Engineering  
 INVESTIGATOR: Pignataro, LJ (Tel (212) 643-5272) Cantilli, EJ Shooman, M

SPONSORING AGENCY: Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Bolger, PH (Tel 202-4264458)

Contract DOT-OS-50241 (CS)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Sept. 1975 TOTAL FUNDS: \$147,000

ACKNOWLEDGMENT: TRAIS (PUR-50315), OST, Polytechnic Institute of New York

12 059248

**FIRE SAFETY TECHNOLOGY ASSESSMENT**

The objective is to perform a comprehensive analysis of fire safety in the passenger compartments of transportation vehicles and crew compartments of rail vehicles, and to provide a documented information base and criteria from which the suitability of proposed standards in each mode can be assessed, or DOT R&D programs can be generated, ranked and prioritized.

PERFORMING AGENCY: Wiggins (J.H.) Company  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6533  
 RESPONSIBLE INDIVIDUAL: Polcari, S (Tel (617) 494-2000)

Contract DOT-TSC-1227 (CPF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$85,290

ACKNOWLEDGMENT: TRAIS (R6533)

12 059864

**EVALUATION OF SAFETY OF LOADING AND SECUREMENT HARDWARE FOR TRANSPORTING WHEELCHAIR PASSENGERS ON TRANSIT VEHICLES**

The objectives includes: (1) developing safety guidelines for wheelchair loading equipment, (2) determining the crashworthiness of standard wheelchairs secured by selected, representative securement systems, (3) comparison of parameters other than safety of systems being tested (i.e., ease of use, acceptability to user, costs), (4) recommendation of design modifications if they are found to be needed, (5) establishment of the cost effectiveness of the securement systems, and (6) development of educational materials for users and operators of wheelchair loading and securement facilities.

PERFORMING AGENCY: California Department of Transportation  
 INVESTIGATOR: Gianturco, A  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, CA-06-0098-00-01

Grant CA-06-0098-00-01 (FFP)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: July 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$160,000

ACKNOWLEDGMENT: TRAIS (CA-06-0098-00-01)

12 059876

**INVESTIGATING SAFETY OF WHEELCHAIRS BOARDING AND SECUREMENT HARDWARE FOR TRANSPORTING WHEELCHAIR PASSENGERS**

NHTSA shall assist UMTA in investigating safety of wheelchair boarding and securement hardware for transporting wheelchair passengers.

PERFORMING AGENCY: National Highway Traffic Safety Administration, Department of Transportation  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, DC-06-0172  
 RESPONSIBLE INDIVIDUAL: Simpich, PE (Tel 202-4269261)

ID AT-70008

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Jan. 1977 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$5,000

ACKNOWLEDGMENT: TRAIS (DC-06-0172)

12 059880

**ASSESSMENT OF THE INCLINED ELEVATORS USED IN STOCKHOLM, SWEDEN**

The objectives of performing an assessment of the Stockholm inclined elevator are: (1) to review the design and implementation experience with this level-change device to determine what has been learned and whether the inclined elevator would be useful for helping the elderly and handicapped change floor-levels in transit stations in the U.S., and (2) to obtain factual engineering, architectural, operational, and user data about this equipment which--if the inclined elevator is deemed worthwhile--can be used in planning and designing future stations and future transit systems in the U.S.

PERFORMING AGENCY: Public Building Services, General Services Administration

INVESTIGATOR: King, J (Tel (202)566-0669)

SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, DC-06-0167

RESPONSIBLE INDIVIDUAL: Simpich, PE (Tel (202) 426-9262)

IA AT-70001 TOTAL FUNDS: \$10,000

ACKNOWLEDGMENT: TRAIS (DC-06-0167)

12 081788

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT**

This project is directed at improving the performance of tank cars in dirailments and minimizing the danger of catastrophic tank car accidents. When initiated, it consisted of 12 Phases with additional Phases subsequently added Phase 03--Materials Study; Phase 08--Reduced Scale Model Studies; Phase 12--Vessel Failure Research 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 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 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: Aug. 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 hardardous 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: Aug. 1977

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: Aug. 1977 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: Aug. 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 ablatives, intumescent, or simply an insulative 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 defined, finally prepare subsequent full scale tests. This was followed by 2 full scale pool fire type tests, one with uncoated & the other with sprayed on type coating 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. A third pool fire test on a full size 112A Car is scheduled for late 1977 at the DOT Test Center. The Tank will be covered by one inch of a mineral wool insulation covered by an 11 gage steel jacket.

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: Aug. 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: Aug. 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 321-5673607)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1970

ACKNOWLEDGMENT: AAR

#### 12 099436

##### RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE I-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: Aug. 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 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)427-4356)

STATUS: Active NOTICE DATE: Aug. 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: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Spencer, PR (Tel (202) 426-0090)

Contract UM-604  
 STATUS: Active NOTICE DATE: Aug. 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, DM (Tel (202) 426-1227)

Contract DOT-FR-64181  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1976 COMPLETION DATE: Dec. 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 objective of the first phase of the research was to develop primary risk models for estimating the probability of failure of each major component in air transportation, rail transportation and highway transportation. The current second year work involves continuation and verification in the highway mode only.

**REFERENCES:**

Development of a Risk Methodology for Transportation Systems Safety, Transportation Systems Safety Research Group, Technical Report, Feb. 1976

Development of a Risk Methodology for Transportation System Safety, Final Report, Oct. 1976

PERFORMING AGENCY: Illinois University, Urbana, Department of Mechanical & Industrial Engineering  
 INVESTIGATOR: White, RA (Tel (217) 333-0356)

SPONSORING AGENCY: Department of Transportation; Illinois University, Urbana

RESPONSIBLE INDIVIDUAL: Rabins, MJ (Tel (202) 426-0190)

Contract DOT-OS-50238  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Sept. 1975 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$159,000

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

**12 149376  
 PASSENGER SAFETY AND SECURITY IN AUTOMATED GUIDEWAY TRANSIT**

Crime, vandalism, emergency first aid, rescue and evacuation services will be the focus of the study of driverless transit systems operating on innovative guideways such as suspended monorail, narrow-bore tunnels and guideways passing through buildings. Experiments will also be performed to determine the effects on passengers of sudden emergency stops. Passenger perception of safety and security will be studied through surveys and interviews. At the conclusion of the study, a workshop will assess the practicality of the guidelines developed.

Virginia University and the Vought Corporation are subcontractors for this research.

PERFORMING AGENCY: Dunlap and Associates, Incorporated; Virginia University, Department of Engineering Science and Systems; Vought Corporation, LTV Corporation

INVESTIGATOR: Pepler, RD

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

STATUS: Active NOTICE DATE: May 1977 START DATE: Mar. 1977 COMPLETION DATE: Mar. 1979 TOTAL FUNDS: \$588,000

13 059244

**RAILROAD PASSENGER SYSTEMS AND EQUIPMENT RESEARCH SUPPORT**

In the area of railroad electrification, a report shall be prepared on railroad electrification describing its potential for application within the U.S. rail system. The report may include, but not be limited to, national benefits and an investigation and subsequent recommendation of the forces which would encourage the railroads to electrify. In the area of passenger train rolling stock R&D, the DOT/FRA has a role in the assessment and evaluation of train systems which may be introduced in the U.S. through Amtrak or other railroads. The FRA must be prepared to render a judgment on the suitability of new equipment being placed into service within the U.S. rail network.

PERFORMING AGENCY: Small Business Administration  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Novotny, RA (Tel (202)426-7612)

IA DOT-FR-64244 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$396,890

ACKNOWLEDGMENT: TRAIS

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.

**REFERENCES:**

Canadian Railway Electrification Study: Phase I Corneil, EA; Lake, RW; Law, Ce; English, GW; Schwier, C, CIGGT, Report 76-2

Canadian Railway Electrification Study: Phase I, Overview Corneil, ER; Law, CE; MacDougal, JL; Schwier, C, CIGGT, Report 76-10

PERFORMING AGENCY: Transportation Research and Development Center, Department of Transport, Canada  
 INVESTIGATOR: Corneil, ER (Tel 613-547-5777)  
 SPONSORING AGENCY: Transportation Research and Development Center, Department of Transport, Canada  
 RESPONSIBLE INDIVIDUAL: Brenckmann, M (Tel 514-283-7846)

Contract 14ST.T8200-5-5507

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: July 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$154,000

ACKNOWLEDGMENT: Transportation Research and Development Center

13 129700

**RAILROAD ELECTRIFICATION/ENERGY PROGRAM**

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.

SPONSORING AGENCY: Federal Railroad Administration, Office of Passenger Systems Research and Development  
 RESPONSIBLE INDIVIDUAL: Novotny, RA

STATUS: Proposed NOTICE DATE: Aug. 1977

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 Vanwinkle, WS

SPONSORING AGENCY: Texas University, Austin, Center for Energy Studies

STATUS: Active NOTICE DATE: Aug. 1977 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: Grainger, GR (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.

PERFORMING AGENCY: Anderson Notten Associates, Incorporated

INVESTIGATOR: McGinley, PG (Tel (617) 227-9272)

SPONSORING AGENCY: Department of Transportation, Office of Environmental Affairs

RESPONSIBLE INDIVIDUAL: Crecco, RF (Tel (202)426-4298)

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: May 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 consumption 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, RH (Tel (202) 223-9525)  
SPONSORING AGENCY: Transportation Systems Center, 55 Broadway, OP-502  
RESPONSIBLE INDIVIDUAL: Pollard, J (Tel (617) 494-2036)

Contract DOT-TSC-1001 (CPFF)

STATUS: Completed NOTICE DATE: Aug. 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: Department 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: Aug. 1977 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 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

Contract

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: Lampros, AF

Contract DOT-OS-60124

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1976 COMPLETION DATE: 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: Uher, RA

SPONSORING AGENCY: Department of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Hopkins, JB

Contract DOT-OS-60129

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: June 1978 TOTAL FUNDS: \$170,840

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 059062

**SOFTWARE DEVELOPMENT FOR THE PROJECTION OF COMMODITY FLOW PATTERNS**

The objective is for the development of data reduction and analysis programs to project commodity flow patterns as an input to development of a national transportation plan.

PERFORMING AGENCY: Small Business Administration  
SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6831  
RESPONSIBLE INDIVIDUAL: Schuessler, RW (Tel (617)494-2000)

Contract DOT-TSC-1155 (FFP)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Feb. 1976 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$29,281

ACKNOWLEDGMENT: TRAIS (R6831)

17 059191

**SOFTWARE MAINTENANCE OF THE SUBWAY ENVIRONMENTAL SIMULATION COMPUTER PROGRAM**

The Subway Environment Simulation (SES) computer program, complete with user and programmer documentation, for use in transit system underground planning and design, is an end product of the Subway Environment Research Project sponsored by Urban Mass Transportation Administration (UMTA). The effort described herein is directed toward facilitating utilization of this program during the first year after public release.

PERFORMING AGENCY: Parsons, Brinckerhoff, Quade and Douglas, Inc

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

RESPONSIBLE INDIVIDUAL: Barrows, TM (Tel (617)494-2000)

Contract DOT-TSC-1216 (CPF)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$19,985

ACKNOWLEDGMENT: TRAIS

17 059344

**ENGINEERING AND TEST SUPPORT SERVICES FOR RAILROAD INSTRUMENTATION, DATA ACQUISITION, PROCESSING AND EVALUATION**

Perform test planning, test operations, special instrumentation support, computer program development, data processing and maintenance to perform assigned tasks having the following objectives: (1) to provide instrumentation that accurately measures the geometry, forces, accelerations, displacements and other physical properties of railroad track structures, vehicles and equipments; (2) provide for the acquisition of data from the instrumentation; and (3) provide for the processing, analysis and evaluation of accumulated data such that meaningful reports are produced.

PERFORMING AGENCY: ENSCO, Incorporated  
SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

Contract DOT-FR-64113 (CPIF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$4,091,000

ACKNOWLEDGMENT: TRAIS

17 059866

**COMPUTER ASSISTED INFORMATION SYSTEM ON TRANSIT SCHEDULES, ROUTES, AND FARES**

This project will develop, demonstrate, and evaluate a prototype computer assisted transit information system to more effectively respond to telephone requests for information on transit schedules, routes, and fares.

PERFORMING AGENCY: Washington Metro. Trans. Auth.  
INVESTIGATOR: Pfansteihl, C (Tel (202)637-1047)  
SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, DC-06-0154  
RESPONSIBLE INDIVIDUAL: Durham, J (Tel (202)426-4022)

Grant DC-06-0154 (FFP)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$435,000

ACKNOWLEDGMENT: TRAIS (DC-06-0154)

17 059874

**COMPUTER TECHNICAL SERVICES FOR PROJECT MONITORING INFORMATION SYSTEM (PMIS)**

The computer support systems currently developed are: (1) Project Monitoring Information System (PMIS), a program oriented management information system for FRA calling for a multi-file system of records dealing with the planning, budgeting, contracting and reporting of FRA's appropriations, programs and projects. Two subsystems of PMIS are Manpower Analysis Reporting Systems (MARS) and Personal Property Data Base (PROPTY). MARS is an organizational management information system concerning FRA personnel. PROPTY records the acquisition of FRA property.

PERFORMING AGENCY: First Data Corporation  
SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
RESPONSIBLE INDIVIDUAL: Grosvenor, AC (Tel (202) 755-9464)

Contract DOT-FR-71832 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1977 COMPLETION DATE: June 1977 TOTAL FUNDS: \$39,565

ACKNOWLEDGMENT: TRAIS



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, 5.16.74

INVESTIGATOR: MacEwen, GH (Tel (613) 547-2915)

SPONSORING AGENCY: Transportation Research and Development Center, Department of Transport, Canada; Canadian Pacific; Queen's University, Canada

Contract D190-12-17(TDA)

STATUS: Terminated NOTICE DATE: Aug. 1977 START DATE: Dec. 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 RRIS 099398 Section 26A, 099400 17A, 099401 17A, 099402 24A, 099403 21A.

REFERENCES:

Freight Car Utilization: Definition, Evaluation and Control, AAR, Pub R-257, Mar. 1977, RRIS 17 157698, 7702

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: Completed NOTICE DATE: Aug. 1977 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 RRIS 099398 Section

26A, 099399 17A, 099401 17A, 099402 24A, 099403 21A.

REFERENCES:

Feasibility of Studying Freight Car Cycle, Using a Sample Fleet Selection with Data Input from TRAIN II & CLM Reprt, AAR (In preparation)

Program Dev, Description & Capability, Using Data Input from TRAIN II & CLM Reporting-Potential Anal Tool, AAR (In preparation)

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: Completed NOTICE DATE: Aug. 1977 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 RRIS 099398 Section 26A, 099399 17A, 099400 17A, 099402 24A, 099403 21A.

REFERENCES:

Feasibility Study of a Centralized Car Location Message System, AAR, PRC Railway Systems, Feb. 1977, RRIS 17 154031, 7702

Profile of an Industry-wide Freight Car Management Plan AAR. (In preparation)

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: Completed NOTICE DATE: Aug. 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.

See Final Report RRIS 17 136821 7702.

## 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: Department of Transportation, Office of Environment, Safety and Consumer Affairs

RESPONSIBLE INDIVIDUAL: Ronayne, M (Tel 202-4264317)

Contract DOT-OS-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: Aug. 1977 START DATE: June 1974 COMPLETION DATE: Oct. 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.

## 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: Aug. 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: Crosby, RW (Tel (202)426-9638)

STATUS: Active NOTICE DATE: Aug. 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 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 (Tel (202) 426-4022)

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) 472-7280)

Contract DOT-FR-T5164

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Sept. 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$69,768

ACKNOWLEDGMENT: FRA

17 152648

**GEOGRAPHICAL DECOMPOSITION OF TRANSPORT NETWORKS**

Determining the appropriate extent of various transport systems is a major issue of national policy. In the analysis of transport networks, particularly for investment appraisal, it is desirable in many instances to concentrate attention and calculations within a limited geographical radius. The dilemma facing the analyst lies between achieving a sufficient degree of detail to be of worth in design terms and tracing the spread of interaction throughout such an integrated system. As the net is cast wider to capture more distant effects, so the computational capacity required to record and manipulate the network expands exponentially. Complete coverage of a city or nation's transport system can only be achieved at a considerable cost in simplifying the representation of the network. One way around this problem is to seek to decompose the network. The objective of this research is to produce a set of rules for dividing a transport network into regions. These divisions should be such that the significant repercussions of changes in the network in one such region are contained within the region or transmitted to the outside via clearly identified articulation points in the network. The task of evaluating benefits and costs arising from particular projects, or designating an optimal set and consequence of additions or deletions to a network, would be made vastly easier if the search for interactions between links could be confined to a small region. The empirical contexts for this search for decomposition principles will be the Chicago Regional Transportation Authority's rail transit planning program and the rail branch line closure process in the State of Illinois.

PERFORMING AGENCY: Northwestern University, Evanston, Department of Geography  
INVESTIGATOR: O'Sullivan, P  
SPONSORING AGENCY: National Science Foundation, Division of Social Sciences, SOC76-16832

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: June 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$27,600

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSS 6090)

17 159625

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 1. STRUCTURING ORGANIZATIONAL CONTROL MECHANISMS TO IMPROVE CAR UTILIZATION**

Examine information systems and corporate relationships which foster utilization improvements. Case studies will be conducted which focus on those decisions which require joint analysis by various departments. Based on this analysis, a new approach will be developed and tested and recommendations then will be made to the industry. Investigate the most critical information needs associated with improved car utilization and the changes in the line of responsibility required to facilitate effective use of the information.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads  
RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)  
Wooden, DG (Tel (202)293-5018)  
STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$295,000

ACKNOWLEDGMENT: AAR

17 159628

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 4. NATIONWIDE FREIGHT CAR MANAGEMENT**

To begin planning a more efficient nationwide freight car management system. Continue the evaluation of the expended Clearinghouse Experiment. Continue the evaluation of Car Service Rules, Orders, and Directives. Design and implement a car grading and commodification to support national level car distribution. Evaluate the impact of customer regulations on the utilization of cars moving in international service. Evaluate the conflict between owner's equity and car utilization embodied in current and proposed freight car management systems. Initiate and freight car management experiments considered necessary. Using the information gained, recommend a nationwide freight car distribution and management system.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads  
RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)  
Wooden, DG (Tel (202)293-5018)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$300,000

ACKNOWLEDGMENT: AAR

17 159631

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, RAILROAD OPERATIONS MODULAR PROCESSING SYSTEMS (ROMES)**

The purpose of the project is to demonstrate the feasibility of a geographically shared railroad operations data processing capability oriented towards satisfying the AAR's TRAIN II information requirements as well as the basic information needs common to principally small railroads. In concept, a single hardware/software system satisfying these needs within a common geographical area would be used by those railroads which cannot economically justify computer systems for themselves. The participating railroads would be connected to a centrally located mini-computer system via a communication link for the transmission and receipt of information as required by the system. The nucleus of the participants would be located in a common geographical area with the remainder situated throughout the country.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads  
RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)  
Wooden, DG (Tel (202)293-5018)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$700,000

ACKNOWLEDGMENT: AAR

17 159648

**NETPAC/2 PROJECT COST AND RESOURCE ACCOUNTING COMPUTER PROGRAM DEVELOPMENT**

To produce a resource and cost accounting system for project planning and control to be added to an existing critical path time program (NETPAC/1). The program will produce 7 report classes (1) progress data (2) project cost (3) cost of work (4) cumulative cost (5) cost histogram (6) resource histogram (7) account code. The program is intended to provide reasonable accurate but timely cost and resource usage information on demand.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport,  
5.63.76

INVESTIGATOR: Law, CE (Tel (613)547-5777) Lockhart, M

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

RESPONSIBLE INDIVIDUAL: Law, CE (Tel (613)547-5777)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug.  
1967 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$60,000

ACKNOWLEDGMENT: CIGGT

18 059221

**GROUP RAPID TRANSIT ELEVATED GUIDEWAY COST**

The contractor shall develop guideway structure cost estimation techniques which are capable of being applied to any elevated concrete guideway rubber-tired vehicle system. These techniques shall be demonstrated by performing ride quality cost projections for a hypothetical (Group Rapid Transit) type system.

PERFORMING AGENCY: Massachusetts Institute of Technology  
SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6537  
RESPONSIBLE INDIVIDUAL: Putukian, J (Tel (617)494-2000)

Contract DOT-TSC-1206 (CR)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$74,780

ACKNOWLEDGMENT: TRAIS (R6537)

18 059894

**STUDY OF FEASIBILITY AND IMPACTS OF ALL-INCLUSIVE TRANSPORTATION TRUST FUNDS AS A MECHANISM FOR TRANSPORTATION FINANCE**

This study will study the feasibility of designing and implementing multi-modal transportation trust funds at the Federal state and regional level. The feasibility analysis will address the following factors: 1) existing and potential funding sources at the respective levels; 2) compatibility among the funds and their levies; 3) institutional changes required to implement these funds; 4) effect on political decision-making process; and 5) flexibility to meet differing transportation needs in the various states and localities.

PERFORMING AGENCY: Polytechnic Institute of New York  
INVESTIGATOR: Roess, RP  
SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, NY-11-0014  
RESPONSIBLE INDIVIDUAL: Davis, J

Grant NY-11-0014

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$50,000

ACKNOWLEDGMENT: TRAIS (NY-11-0014)

18 059896

**ALLOCATION OF TRANSIT SUBSIDIES**

The objective is to develop an analytical methodology for the rational allocation of subsidies to different transit lines and modes. The proposed research makes use of a simple analytical structure for the management of transit systems. Based on the demand and cost modes, explicit expressions can be derived for any measure of equity or efficiency such as subsidy per passenger, cost per passenger mile, etc.

PERFORMING AGENCY: Princeton University  
INVESTIGATOR: Lion, PM  
SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, NJ-11-0004  
RESPONSIBLE INDIVIDUAL: Davis, J (Tel (202) 426-4060)

Grant NJ-11-0004

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$58,062

ACKNOWLEDGMENT: TRAIS (NJ-11-0004)

18 059897

**REGIONAL FINANCING ALTERNATIVES FOR MASS TRANSIT**

The project will compare alternative regional financing mechanisms for mass transit in terms of their economic efficiency, equity, fiscal impact, locational and land use incentives, and administrative feasibility. Six alternative revenue sources will be analyzed and evaluated according to the following criteria; 1) property (and land) taxes; 2) income taxes; 3) sales taxes; 4) user charges; 5) intergovernmental grants; and 6) general revenues.

PERFORMING AGENCY: Syracuse University  
INVESTIGATOR: Puryear, D

SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, NY-11-0003  
RESPONSIBLE INDIVIDUAL: Davis, J (Tel (202)425-4060)

Grant NY-11-0003

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$98,062

ACKNOWLEDGMENT: TRAIS (NY-11-0003)

18 059931

**DEVELOPMENT OF COMPUTER SYSTEM FOR COST-EFFECTIVE MAINTENANCE OF RAIL EQUIPMENT IN URBAN MASS TRANSIT SYSTEMS**

Objective: Development of a model to aid transit management in the evaluation of existing vehicle maintenance schedules and the development of new/revised schedules. The following factors are considered in the model: 1) budgetary constraints 2) manpower availability and productivity 3) vehicle breakdown patterns 4) composition of vehicle fleet 5) transit service objectives.

PERFORMING AGENCY: Boston University, Department of Business Administration  
INVESTIGATOR: Herniter, J (Tel (617)353-4606)  
SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, MA-06-0073  
RESPONSIBLE INDIVIDUAL: Hallmann, AB (Tel (202)426-9274) George, BF (Tel (202)426-9274)

Grant DOT-MA-06-0073

STATUS: Active NOTICE DATE: July 1977 START DATE: Mar. 1976 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$47,382

ACKNOWLEDGMENT: TRAIS (MA-06-0073)

18 080324

**THE RAILWAY FREIGHT RATE ISSUE IN CANADA**

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, 4.33.74  
SPONSORING AGENCY: Canadian Institute of Guided Ground Transport; Canadian National Railways; Canadian Pacific

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1974 COMPLETION DATE: 1978 TOTAL FUNDS: \$26,388

ACKNOWLEDGMENT: CIGGT

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 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 study, funded by Canadian National, is essentially a conceptual examination and critical analysis of replacement value costing principles as they might be applied to railway operations. The recommendations, concerning the use of a replacement value system, particularly address the selection of cost information pertinent to the service pricing decision. Freight car capital charges are an important and relatively uncomplicated component of unit costs, and hence were chosen as an example. The development was directed towards the determination of a realistic unit capital charge per unit time (cost per car per year).

##### REFERENCES:

Replacement value costing-concepts and methodology Lake, RW; MacDonald, JA; and Schwier, C, CIGGT RPT #77-7, June 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 4.53.76

INVESTIGATOR: Lake, RW (Tel 547-5777) MacDonald, JA Schwier, C

SPONSORING AGENCY: Canadian National Railways

Contract

STATUS: Active NOTICE DATE: July 1977 START DATE: Mar. 1976 COMPLETION DATE: 1977 TOTAL FUNDS: \$6,000

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, Merwick, 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: Newkirk, 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.

PERFORMING AGENCY: Price Waterhouse and Company

INVESTIGATOR: Scanlan, J

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; Akylimaz, 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 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

18 159635

**RAILWAY COSTING ORDER REVIEW**

No Abstract.

**PERFORMING AGENCY:** Canadian Institute of Guided Ground Transport, 7.77.76

**INVESTIGATOR:** Lake, RW (Tel 547-5777) Schwier, C Roney, MD

**SPONSORING AGENCY:** Canadian Transport Commission

**RESPONSIBLE INDIVIDUAL:** Lake, RW

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1977 COMPLETION DATE: June 1978 TOTAL FUNDS: \$100,000

ACKNOWLEDGMENT: CIGGT

18 159647

**FORECASTING CHANGES IN COST COMPONENT PROFILES**

It is intended that the study will investigate the forces which will cause differential cost escalation, develop cost level for casting techniques, and prepare a set of indices that can be applied to railway cost component estimates beyond the normal planning horizon.

**PERFORMING AGENCY:** Canadian Institute of Guided Ground Transport, 4.59.76

**INVESTIGATOR:** Daub, M (Tel 547-3075)

**SPONSORING AGENCY:** Canadian National Railways; Canadian Transport Commission

**RESPONSIBLE INDIVIDUAL:** Lake, RW

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$7,800

ACKNOWLEDGMENT: CIGGT

18 159651

**CAPITAL NEEDS STUDY**

Under Section 504 of the Railroad Revitalization and Regulatory Reform Act of 1976 the following studies are required: (1) Estimates of deferred maintenance and delayed capital expenditures as of 1975 for all Class I railroads except Conrail; (2) Projection of the total maintenance and capital needs of the Class I railroads for each of the years 1976 through 1985; (3) Recommendations as to the amount and type of federal financial assistance, if any, to be provided to the railroads to help meet these projected needs.

**PERFORMING AGENCY:** Federal Railroad Administration, Office of Policy and Program Development

**INVESTIGATOR:** Till, TA (Tel (202)426-0382)

**SPONSORING AGENCY:** Federal Railroad Administration

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1977 COMPLETION DATE: Jan. 1978



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: Gorsuch, L

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Swerdlow, CN

Contract DOT-OS-40008 (CS)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1973 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$222,959

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, SA (Tel (617) 661-8700) Witten, J

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, OP-602

RESPONSIBLE INDIVIDUAL: Anderson, DL (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 made. Various methods of data collection, processing, storage and retrieval and their related costs are 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

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: Aug. 1977 START DATE: Apr. 1975 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 of alternative energy conservation policies on total sales of new cars and on the distribution of sales by size-class and origin (foreign vs domestic), 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 (no 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) 494-2036)

Contract DOT-TSC-1060 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$146,075

ACKNOWLEDGMENT: TRAIS

**20 059169**

**FLOW OF COMMODITIES THROUGH BUREAU OF ECONOMIC ANALYSIS AREAS**

The objective is to obtain from the Bureau of Census 1972 data on the flow of commodities from Bureau of Economic Analysis (BEA) Area origins to BEA Area destinations. These flows will serve as input to the National Transportation Plan by providing a basis for the projection of commodity movement to 1990.

PERFORMING AGENCY: Department of Commerce, Economic Surveys Division  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

IA RA-76-27

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: Aug. 1976 TOTAL FUNDS: \$36,700

ACKNOWLEDGMENT: TRAIS

**20 059189**

**FORECAST OF NATIONAL ECONOMIC ACTIVITY**

The main purposes of this procurement are to obtain from the Bureau of Economic Activity (BEA) the basic data files needed to translate forecasts of national economic activity into regional projections; to obtain examples of applications of the Regional Industrial Multiplier System useful in estimating the direct, indirect and induced effects of changes in the output of an industry on a region; and to obtain research assistance in developing a sound commodity flow projection method.

PERFORMING AGENCY: Department of Commerce, Bureau of Economic Analysis  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

IA RA-76-29

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$10,000

ACKNOWLEDGMENT: TRAIS

**20 059680**

**TRANSPORTATION REQUIREMENTS FOR COAL MOVEMENTS THROUGH 1985**

The primary objective is to identify and analyze transportation industry estimates of the volume of coal that will be moved by rail and barge in 1985 by major origin/destination patterns in coal traffic. Major coal traffic corridors shall be examined for possible constraints which would prevent the meeting of coal use goals for 1985. Transportation industry planning processes for future coal traffic shall also be examined and described.

PERFORMING AGENCY: Small Business Administration  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6814T

Contract DOT-TSC-1282 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Aug. 1976 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$73,500

ACKNOWLEDGMENT: TRAIS (R6814T)

**20 080313**

**FREIGHT CAR DEMAND INFORMATION AND FORECASTING RESEARCH PROJECT**

To create a functional design of the elements and processes 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) 426-2920)

Contract DOT-FR-30058

STATUS: Active NOTICE DATE: Aug. 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. Completed research covers trade flows, barriers to trade and economic impact of trade between Alaska and Washington.

See also RRIS 20A 099627.

**REFERENCES:**

An Overview of Trade Between Alaska and Washington Casavant, K; Thomas, W, Pacific Northwest Conference, Victoria, Canada, May 1976  
 Trade Interdependencies: The Case of Alaska & Washington Casavant, K; Thomas, W, Am Agric Economics Assoc, Pennsylvania, Aug. 1976  
 Trade Interdependencies: The Case of Alaska & Washington, Agroborealis, Casavant, K; Thomas, W, 9:1, Jan. 1977  
 Input-Output Tables for Alaska's Economy: A First Look Logsdon, CL; Casavant, K; Thomsa, W, Alaska University, Agric Experimental Station, Bulletin 48, Mar. 1977

PERFORMING AGENCY: Alaska University, College, Department of Agricultural Sciences  
 INVESTIGATOR: Thomas, WC  
 SPONSORING AGENCY: Department of Agriculture, ALK-274-5584

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1973 COMPLETION DATE: Sept. 1977

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. The effects of railroad reorganization and branch-line abandonment were found to be related to the available alternatives. In areas with access to water or with nearby processing points on main rail lines the effects on costs, volumes, growth, and agricultural production were negligible. In areas presently dependent on rail transport to distant destinations such as export, rail abandonment increased costs and shifted volumes among elevators. A case study of two areas where rail service had been discontinued showed a minor effect on grain elevators within trucking distance of the river, but more distant elevators experienced a relative decrease in grain shipments when compared with similar elevators retaining the rail service. Fertilizer and feed firms showed little changes in volume but an increase in costs of transportation. Introduction of user charges on barges also shifted volumes of grain among modes and destinations. Small increments, 0.05 cent to 0.1 cent per ton mile had negligible effects. Lower rail rates (specifically unit train rates to the Gulf) were not reflected in higher prices to farmers, at least in the 3-year period studied. No significant differences levels of variance in prices paid to farmers as a result of the introduction of unit trains.

#### REFERENCES:

The Impact of Unit Trains on Corn Price Relationships at Country Elevators: Two Case Studies, Hoffman, LA; Birmingham, SC; Hill, LD, Illinois Agricultural Economics, July 1976

**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:** Aug. 1977 **START DATE:** July 1971

**ACKNOWLEDGMENT:** Illinois University, Urbana (CRIS 0064467), Smithsonian Science Information Exchange (gy 64467 1)

20 083533

#### ECONOMIC ANALYSIS OF THE UNITED STATES GRAIN EXPORTING SYSTEMS

Evaluate private versus state trading systems for grain with respect to: Returns to producing, marketing and processing firms; relative market power between countries with different systems; comparative advantage; relative efficiencies of time, farm and place utilities under different systems; rate of technological change and progress including capital losses and replacement; their respect to commodity futures markets. Evaluate alternative export marketing techniques and strategies with respect to: the adequacy of the U.S. system of grades and standards; the logistics of costs of marketing and transportation. Comparative data will be collected on Canadian and U.S. grain handling costs and procedures. Structural and policy differences will be compared wherever possible. System performances will be compared on the basis of handling costs and producer returns. Analysis of capital investment decisions in the two systems will also be made. Data on price quality relationships for wheat will be collected and analyzed to determine the validity of present grading factors. North Dakota production data will be assembled on a county basis for use in a transportation model designed to analyze various rate policies for west bound shipments of wheat and barley. Existing transportation rates will be used to generate optimal flow patterns. Alternative rate policies will be compared to existing rate solutions. A manuscript is in process on a study of North Dakota Farmers Grain

Marketing Strategies. The major factors influencing the selection of market outlet by farmers were price, convenience, grading practices, loyalty to firm, credit provisions for purchases and availability of farm supplies. Price and availability of labor were major factors in determining timing of grain sales. A survey of country elevators designed to basic marketing strategies and to review sale and procurement practices used by a random sample of firms was initiated. This study was a part of a regional study of country elevator marketing practices. The state and regional data are being analyzed and a Master's thesis is expected to be completed in early 1976. Preliminary results indicate that country elevators make limited use of futures markets in covering grain purchases. To-arrive contracts with terminal grain merchants are the predominant method of covering long grain positions in most states. The predominant method of transfer of grain ownership is still cash purchase at delivery by farmers; however forward contracting and farming of deferred pricing and pooling arrangements are becoming popular in several states of the North Central Region.

#### 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:** Aug. 1977 **START DATE:** July 1971 **COMPLETION DATE:** Sept. 1981

**ACKNOWLEDGMENT:** North Dakota State University (CRIS 0060238)

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. For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulation at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean producing area showed that adverse impacts from rail line abandonment are not likely to be uniform. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate, service and other proposals for change in transportation were analyzed for their impacts on agriculture.

#### 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 Cuttlemen's Ass, Jan. 1974

Changing Technology in Grain Transportation Hutchinson, TQ, International Corn 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: Aug. 1977 START DATE: June 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, 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. For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulation at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean producing area showed that adverse impacts from rail line abandonment are not likely to be uniformly borne. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate, service and other proposals for change in transportation were analyzed for their impacts on agriculture.

#### **REFERENCES:**

Livestock, Trucking Services: Quality, Adequacy and Shipment Patterns, Hoffman, LA; Boles, PP; Hutchinson, TQ, Economic Res Service, AFR-312, Oct. 1975

Operations of For-Hire Livestock Truckers Boles, PP, Economic Res Service, AER-342, July 1976

Impact of Higher Gasoline Prices on Rural Households, Hoffman, LA, Economic Res Service, 4 pp, Apr. 1976

Discussion of a Sequential Link Approach to Evaluating Transportation Facility Adjustments, Gerald, JO, Sou. Journal of Agric Econ., V8 N1, pp 35-37, July 1976

Estimation of Demand for Transp of Agric Commod Miklius, W; Casavant, KL; Garrod, PV, Amer Journal of Agric Econ, V58 N2, pp 217-223, May 1976

PERFORMING AGENCY: Economic Research Service, Department of Agriculture

INVESTIGATOR: Gerald, JO Hutchinson, TQ

SPONSORING AGENCY: Department of Agriculture, NEA-14-125-11-00

STATUS: Active NOTICE DATE: Aug. 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, 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. For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulations at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean producing area showed that adverse impacts from rail line abandonment are not likely to be uniformly borne. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate, service and other proposals for change in transportation were analyzed for their impacts on agriculture.

#### **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 Cattlemen'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: Aug. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information System (GY 41787), Smithsonian Science Information Exchange (CRIS 0041787)

**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 transportations 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: Transportation Research and Development Center, Department of Transport, Canada

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 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: Department of Commerce, Economic Surveys Division, 63-7108

INVESTIGATOR: Torene, R (Tel (202)763-5430)

SPONSORING AGENCY: Office of Policy, Plans and International Affairs; Department of Transportation, Office of Systems Analysis and Information

RESPONSIBLE INDIVIDUAL: Murphy, RD (Tel (202)426-4448)

Contract DOT-AS-50059

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1975 COMPLETION DATE: June 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, Department of Transportation; 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 136118

##### ANALYSES OF REGIONAL DEVELOPMENT AND GROWTH IN THE UNITED STATES

OBJECTIVE: Develop and maintain data related to economic development and growth in the nation's regions and rural areas. Identify differences in economic development and growth. Evaluate the factors that cause some regions to develop and grow faster than others. Identify links between types of economic development and underlying factors. PROGRESS: Work on a historical analysis of the economic, social and institutional factors underlying variations in regional development was partially completed. Attention was given to determining general forms of casual linkages between the level of regional development and the quality of basic determinants of regional development. The determinants considered are natural resource endowments; labor; public and private capital; education, political and legal institutions; and production, transportation and communication technology. The relationships between basic determinants and level of development are examined for regions in several periods of time between 1790 and 1970's. Emphasis is placed on those determinants which, when considered together, provide an integrated, chronological perspective on lagging levels of economic activity and low incomes characteristic of some U.S. regions. Major service activities--Coordinated ERS's activities for and prepared two background papers for the Interagency Task Force that prepared the 1974 National Growth Report to the Congress (0.4 man-years).

PERFORMING AGENCY: Department of Agriculture, Economic Development Div, Regional Analysis Prog Area

INVESTIGATOR: Coltrane, R

SPONSORING AGENCY: Department of Agriculture, Economic Development Division, 0041986 ED-60-440-11-00

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 41986 1)

#### 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. **PROGRESS REPORT:** Analysis of truck transportation costs completed and applied to an area of proposed rail abandonment to estimate income loss to producers and effects on grain elevators.

**PERFORMING AGENCY:** South Dakota State University, Department of Economics

**INVESTIGATOR:** Payne, WF

**SPONSORING AGENCY:** Department of Agriculture, South Dakota Cooperative State Research Service, 0065580 SD00694

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1974 **COMPLETION DATE:** June 1977

**ACKNOWLEDGMENT:** Current Research Information Service (0065580)

### 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. 1. A study of grain production and marketing in Northwest Missouri has been completed together with a projection of transportation demand for movement of grain to 1980 and 1985, to determine a grain distribution system which would yield the highest net return to producers and marketers within the region. Study results indicate the possibility of a contribution of as much as \$2.6 million per year in farmer net income, before considering transportation and elevator upgrading costs, through adjustment of assembly and storage patterns to permit long-haul transport in larger volume shipments at lower cost. 2. A study of the condition, capacity and impediments to efficiency in Missouri's transportation system has been finalized for publication. The study documents the need for special attention to upgrading of rural roads and bridges; identifies segments of the railroad system with service limitations requiring attention; and highlights the possibilities for improved utilization of our underemployed inland waterway resources as a promising target for further study. Findings of this study have important implications for both public and private sector decision making. 3. Data collection is proceeding for estimation of transportation demand for grain and fertilizer, on a state-wide basis by counties, in 1980 and 1985.

#### 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, DE

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Aug. 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 flow of 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, DW

**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. **PROGRESS REPORT:** A study of nonresidential and nonhousekeeping building construction activity found it increased from 1 billion square feet in 1961 to 1.7 billion square feet in 1973. The largest increase was in commercial buildings such as stores, warehouses, and office buildings. Nonhousekeeping, hospital, and other buildings also showed increases. Construction of industrial, religious, and educational buildings declined during the period. Lumber, plywood, hardboard, and particleboard usage in these structures increased during the period, while glue-laminated lumber, insulation board, and structural wood-fiberboard decreased. Construction value for all building increased from \$16.05 per square foot of floor area in 1961 to \$24.15 in 1973--an average annual rate of 3.5 percent. A computer retrieval and compiling system has been established, containing primary wood processing mill capacity, type, and location for analysis of trends and regional patterns in timber requirements. Annual woodpulp capacity in the U.S. has increased from 4.4 to 51.5 million tons since 1920, with average mill capacity increasing nearly ten times to 426 tons per day. Kraft pulp capacity now dominates the industry with the South leading in total pulping capacity. Panelboard production capacity data have been collected.

**PERFORMING AGENCY:** Forest Products Laboratory, FPL-4202

**INVESTIGATOR:** Stone, RN Marcin, TC Reid, WH

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Aug. 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. **PROGRESS REPORT:** For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulation at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean producing area showed that adverse impacts from rail line abandonment are not likely to be uniformly borne. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate service and other proposals for change in transportation were analyzed for their impacts on agriculture.

**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, USDA 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:** Aug. 1977 **START DATE:** July 1974 **COMPLETION DATE:** July 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 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; Wyoming State Government

**INVESTIGATOR:** Meyer, EG Freudenthal, DW

**SPONSORING AGENCY:** National Science Foundation, Division of Policy Research and 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 possible stockout. During the second year of the contract, the research will be focused on the supply side and examined 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 firm 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 (Tel (617) 253-7123)

**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

**20 152652****ALTERNATIVE MEANS OF SUPPLYING WESTERN COAL TO TEXAS ELECTRIC POWER PLANTS**

**DESCRIPTION:** With the increased shift from natural gas and fuel oil to coal as a boiler fuel, the bottleneck in supplying this energy source may



become the means of transportation. Two major modes of transportation are unit trains and coal slurry pipelines. These modes have radically different characteristics such that comparing these alternatives or combination of them is difficult. This research is directed toward examining several coal demand centers in Texas, their time profile of demand till the end of the century and to determine the optimal capacity expansion of these two modes so as to minimize the present value of total cost of owning and operating.

PERFORMING AGENCY: Texas University, Austin, Department of Mechanical Engineering

INVESTIGATOR: Lesso, WG White, D

SPONSORING AGENCY: Texas University, Austin

STATUS: Active NOTICE DATE: Nov. 1976 START DATE: July 1975 COMPLETION DATE: June 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (NTX 711)

#### 20 153714

##### APPRAISAL OF THE CAPABILITY OF THE TRANSPORTATION SYSTEM TO MEET NEEDS OF AGRICULTURE AND RURAL AREA

An analysis of the transportation capacity to move agricultural inputs and products was completed which examined use of equipment and rail equipment capacity. It was found that flexible rail service pricing could help equipment allocation. Also assessed were rural highways and trucking, general freight service, transportation of people, transportation related to rural development, and rail abandonment. Conditions of rural roads and potential for improvement should be considered in rail abandonment decisions. Retaining all present rails would apparently be uneconomic. But abandonment of all unprofitable lines could cause hardships. Private automobiles and trucks will probably continue to dominate travel of rural residents and few alternatives exist in rural areas in serving the disadvantaged. Most perishables and general rural freight move by highways. In separate analysis, impacts of rail abandonments on two rural Corn Belt regions were studied by comparing firms losing service with firms retaining service. Rail abandonment was accompanied by minor impacts on grain elevators in one region, but substantial impacts were observed in the other. Feed firms losing service suffered little in either region. Fertilizer distributors in both regions losing service suffered in ability to compete with other distributors. No clear indication of significant reduction in employment by shippers were observed in either region.

PERFORMING AGENCY: Kansas State University, USDA National Economic Analysis Division

INVESTIGATOR: Sorenson, LO

SPONSORING AGENCY: Economic Research Service, Department of Agriculture, 0041973 NEA-14-126-20-01-X1

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 41973 2)

#### 20 156542

##### EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION

Estimate rural freight transportation requirements to 1985 and 1990. Estimate the optimal rural freight transportation storage and distribution system. Evaluate the economic effects of alternative railroad ownership and financial policies.

PERFORMING AGENCY: Michigan State University, East Lansing, Department of Agricultural Economics, CSRS MICL

INVESTIGATOR: Thompson, SR

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, MICL01254

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070878)

#### 20 156591

##### EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION, STORAGE, AND DISTRIBUTION SYSTEMS

The project at Minnesota is designed to analyze the impact of alternative methods of rail rate-making on grain flows and the location and logistics of grain processors. The study examines the current regulatory process as it applies to rates and proposed reforms in the process. Then, comparisons between the existing rate structure and costs of service will be made. In this way, the social cost and benefits of regulation can be determined.

REFERENCES:

Railroad, Grain Transportation and the Interstate Commerce Commission, Martin, M; Dahl, R, Minnesota Agricultural Economist, Jan. 1977

PERFORMING AGENCY: Minnesota University, St Paul, Department of Agricultural and Applied Economics, CSRS MIN

INVESTIGATOR: Dahl, RP (Tel (512)276-3436) Martin, MV

SPONSORING AGENCY: Department of Agriculture, MIN-14-043; Minnesota University, St Paul, Department of Agricultural and Applied Economics

RESPONSIBLE INDIVIDUAL: Dahl, RP (Tel (612)376-3436)

STATUS: Active NOTICE DATE: June 1977 START DATE: Oct. 1976 COMPLETION DATE: Oct. 1981 TOTAL FUNDS: \$6,200

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0071288), Minnesota University, St Paul

#### 20 156604

##### EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS

The project will: estimate rural freight transportation requirements to 1985 and 1990, estimate the optimal rural freight transportation, storage and distribution system; evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers, receivers and rural communities. The present rural transport system will be described. Demand for transportation 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 model combinations and regulatory patterns. Merits of alternative systems and policies will be evaluated.

PERFORMING AGENCY: Missouri University, Columbia, Department of Agricultural Economics, CSRS MO

INVESTIGATOR: Moser, DE

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, M000040-1

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070255)

#### 20 156714

##### EVALUATION OF ALTERNATIVE RURAL FREIGHT, TRANSPORTATION STORAGE AND DISTRIBUTIVE SYSTEMS

To estimate rural freight requirements to 1985 and 1990. To estimate the optimal rural freight transportation storage and distribution systems. To evaluate the economic effects of alternative railroad ownership and financial policies. To evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers and receivers.

PERFORMING AGENCY: Ohio State University, Department of Agricultural Economics and Rural Sociology, NC-137 CSRS OHO

INVESTIGATOR: Larson, DW

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, OHO00572

RESPONSIBLE INDIVIDUAL: Larson, DW (Tel (614)422-6731)

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0071704), Ohio State University

20 159642

**FORECASTING THE DEMAND FOR TRANSPORT SERVICES  
USING AN ECONOMETRIC MODEL**

An econometric model of the demand for railway freight transportation disassembled by commodity is constructed. Input-output analysis is used to link rail freight movements with economic activity as measured by the major expenditure components of GNP.

PERFORMING AGENCY: Queen's University, Canada, Department of Economics, 4.10.74

INVESTIGATOR: Sparks, GR (Tel 547-2701) Cao, PS

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport; Queen's University, Canada; Canadian National Railways

RESPONSIBLE INDIVIDUAL: Sparks, GR

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: Dec. 1974 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$4,850

ACKNOWLEDGMENT: Queen's University, Canada

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: Terminated NOTICE DATE: Aug. 1977 START DATE: July 1973

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.

**REFERENCES:**

Railroad Classification Yard Technology: A Survey and Assessment, Petracek, SJ; Moon, AE; Kiang, RL; Siddequee, MW, FRA/ORD-76/304, Jan. 1977, RRIS 151748, 7702

PERFORMING AGENCY: Stanford Research Institute

INVESTIGATOR: Petracek, SJ (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: Completed NOTICE DATE: Aug. 1977 START DATE: Jan. 1975 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$127,781

ACKNOWLEDGMENT: FRA

21 058279

**SYSTEMS ENGINEERING FOR INTERMODAL FREIGHT 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: Blanchfield, JR (Tel (202)426-0808)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1977 COMPLETION DATE: May 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. Full scale experiments will be conducted at the DOT Test Center in Pueblo in order to validate the wind tunnel results.

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: Kiper, JK (Tel (202) 426-0808)

Contract DOT-TSC-1002 (FFP)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1975 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$78,000

ACKNOWLEDGMENT: TRAIS (612-0278-AT)

21 059373

**STUDY OF IMPACTS OF ENERGY-USE CONSTRAINTS ON U.S. FREIGHT OPERATIONS**

This study will develop a transportation network and operation based methodology to examine the energy cost, shipper impact and transportation investment tradeoffs implied by various conservation options for freight movements. The model will compute changes in energy use, implied mode investments, and in shipment characteristics. A benefit/cost evaluation procedure will then consider tradeoffs among these elements for each conservation option to determine optimal system configuration under joint objectives of reducing energy use in freight transportation while maintaining shipper services and investment levels to assure industry viability.

PERFORMING AGENCY: CACI Incorporated

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6814

RESPONSIBLE INDIVIDUAL: Anderson, DL (Tel (617)494-2000)

Contract DOT-TSC-1252 (CPF)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Aug. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$122,277

ACKNOWLEDGMENT: TRAIS (R6814)

21 059702

**AUTOMATIC CAR IDENTIFICATION**

No Abstract.

PERFORMING AGENCY: Small Business Administration

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6335

IA DOT-TSC-1234 (FFP)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$67,000

ACKNOWLEDGMENT: TRAIS (R6335)

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/Mgmt Comm, Federal Railroad Administration  
 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, DM (Tel (202) 472-7280)

Contract EB-400-0-ARR-849

STATUS: Active NOTICE DATE: Aug. 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.

See also RRIS 17A 900399, 17A 900499, 17A 900401, 21A 900403, 21A 138525, 24A 900402.

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: Completed NOTICE DATE: Aug. 1977 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 RRIS 099398 Section 26A, 099399 17A, 099400 17A, 099401 17A, 099402 24A.

**REFERENCES:**

Railroad Reliability and Freight Car Utilization: An Introduction, AAR, MIT Rpt. CTS 75-8, July 1975, RRIS 21 139445, 7701

Railroad Reliability and Freight Car Utilization AAR (In preparation)

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: Completed NOTICE DATE: Aug. 1977 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. Research was initiated on development of a new concept for storage and transport of grain which would feature recyclable metal containers for use in movement of the

product from farm to end user. Numerous combinations of container shapes and sizes and special handling equipment were considered and evaluated. Although a final decision has not yet been made, a container with a capacity of about 1,500 pounds appears to be the most feasible, and work in FY 77 will be directed toward a system using a container of that approximate capacity.

PERFORMING AGENCY: Agricultural Research Service, Transportation Facilities Division, 1104-15841-006  
 INVESTIGATOR: Guilfooy, RF, Jr  
 SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 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) 472-7280)

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) 472-7280)

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 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: Agricultural Marketing Research Institute, Transportation and Packaging Research Laboratory, 1104-15841-011  
 INVESTIGATOR: Hoke, KE  
 SPONSORING AGENCY: Agricultural Research Service, Department of Agriculture, 0041945

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 COMPLETION DATE: Nov. 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0041945), Smithsonian Science Information Exchange (GY 41945 2)

**21 138525****FREIGHT CAR UTILIZATION PROGRAM-PHASE I. TASK 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 AAR, Pub R-234, June 1976, RRIS 21 139443, 7701

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: Completed NOTICE DATE: Aug. 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 Transp of the Labor/Mgmt Comm, Federal Railroad Administration  
 INVESTIGATOR: Adamson, E McGuire, T  
 SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Collins, DM (Tel (202)472-7280)

STATUS: Active NOTICE DATE: Aug. 1977 TOTAL FUNDS: \$682,050

ACKNOWLEDGMENT: FRA

**21 148356****IMPROVED CONTROL TECHNIQUES TO REDUCE IMPACT DAMAGE IN MARSHALLING YARDS**

A simulation of marshalling yard operations has been developed representing a significant advance over previous simulations. With emphasis on the frequency of overspeed (potentially damaging) impacts, it was validated using traffic and layout data from the Dorval Yard of Canadian National Railways. It reveals the dependency of overspeed impacts and poor track utilization on retarder release-speed policy and on the profile of the classification tracks. It is readily adapted to other yards and traffic flows. Features of the Monte Carlo approach include nine classification tracks, dual humpleads, realistic traffic flow features, and interactions between moving cuts. The simulation program is in FORTRAN IV. Trial runs on a representative yard configuration indicate that substantial improvements at any yard may be possible through such means as (1) incorporation of a retarder release-speed policy which, in addition to "Distance-to-Go" information, uses a measurement of the velocity of the preceding car, (2) alteration of the gradients in the classification tracks, (3) minor alteration to the target speed.

**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

Reduction of Impact Damage in Automatic Marshalling Yards, Kerr, CN, C.I.G.G.T., Report No. 77-11, June 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
 INVESTIGATOR: Kerr, CN (Tel (613) 547-3238)

SPONSORING AGENCY: Canadian National Railways; Canadian Institute of Guided Ground Transport

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: May 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$11,000

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.

**REFERENCES:**

Railroad Yard Operation Case Study. Marshalltown Shirazian, GR, Iowa State University, Unpublished MS Thesis, 1977

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: Aug. 1977 START DATE: July 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$2,300

ACKNOWLEDGMENT: Iowa State University, Ames

**21 157598****HOUSTON TERMINAL PROJECT**

The Houston Terminal Project is a labor, management and government undertaking under the auspices of the Labor-Management Committee. Like its predecessors in St. Louis and Chicago, this project is an attempt to critically review and analyze both work rule agreements and management practices within the Houston Terminal. The Houston Terminal was chosen as an experimental site because of its unique operating characteristics as a major port area and huge petrochemical distribution area.

Additional funding provided by railroad labor organizations and Houston, Texas, area Railroads.

PERFORMING AGENCY: Task Force on Rail Transp of the Labor/Mgmt Comm, Federal Railroad Administration

INVESTIGATOR: Spitz, J (Tel (713)224-3662) Dessens, F (Tel (713)224-3662)

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Collins, DM Federal Railroad Administration (Tel (202)472-7280)

STATUS: Active NOTICE DATE: July 1977 START DATE: 1977

ACKNOWLEDGMENT: FRA

**21 157902****INTERMODAL FREIGHT SERVICES EAST OF THE HUDSON RIVER**

The objective is to improve rail freight connections with truck and marine operations in the New York City and Long Island areas. In addition to New York City, the Long Island counties of Nassau and Suffolk will be involved in the study.

Announcement of this study was published in Traffic World, V 171, N 1 (July 4, 1977), P 18.

PERFORMING AGENCY: New York City Planning Commission, New York City Department of City Planning; New York State Department of Transportation, Planning Division

SPONSORING AGENCY: New York State Legislature

STATUS: Active NOTICE DATE: July 1977 START DATE: July 1977 TOTAL FUNDS: \$400,000

21 159624

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II**

As freight car utilization is a nationwide problem beyond the ability of a single railroad to solve, a cooperative research program (Phase I) between the railroad industry and the Federal Government was started in 1975 and completed in 1977. The second phase of this program will oversee the establishment and conduct of six different task forces to address and overcome those critical facets of the freight car utilization problems identified in Phase I. These task forces will structure case studies and demonstration programs which will facilitate the adoption of improvements throughout the industry. Each group will address a different facet of the utilization problem to include management organizations and practices, utilization impacts of railroad operating plans, railroad customer coordination, nationwide freight car management, railroad freight car distribution, and utilization impacts of freight car design and serviceability. All will emphasize the need for explicit adoption of systems which respond to the need to more actively and integrally manage the car fleet.

PERFORMING AGENCY: Association of American Railroads  
 SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads  
 RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)  
 Wooden, DG (Tel (202)293-5018)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977  
 COMPLETION DATE: July 1979 TOTAL FUNDS: \$2,388,420

ACKNOWLEDGMENT: AAR

21 159626

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 2. UTILIZATION AND SERVICE RELIABILITY IMPACTS OF OPERATING PLANS**

Identify those operating practices which most directly impact utilization or service reliability. Needed mechanisms to initiate change will be developed. Theoretical work coupled with demonstration project will be used to define those strategies which best integrate operating decisions. Physical and financial changes resulting from the implementation of hourly car hire will be measured. Major elements of existing labor rules will be analyzed as they relate to the relationships between operating plans and car utilization. Continue previous analysis of the car cycle.

PERFORMING AGENCY: Association of American Railroads  
 SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads  
 RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)  
 Wooden, DG (Tel (202)293-5018)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977  
 COMPLETION DATE: July 1979 TOTAL FUNDS: \$370,000

ACKNOWLEDGMENT: AAR

21 159627

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 3. UTILIZATION IMPACTS OF CUSTOMER-RAILROAD RELATIONSHIPS**

Improved rail-customer coordination is necessary for many strategies to improve freight car utilization. Car studies will be developed quantifying the impact which specific customer practices have on railroad service and fleet utilization. Initiate studies designed to reduce the number of cars needed in specific assigned pools. Develop a theoretical framework which permits an explanation of potential improvements in car distribution efficiency through demand levelling. Define additional strategies to improve rail-customer coordination.

PERFORMING AGENCY: Association of American Railroads  
 SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads  
 RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2920)  
 Wooden, DG (Tel (202)293-5018)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977  
 COMPLETION DATE: July 1979 TOTAL FUNDS: \$265,000

ACKNOWLEDGMENT: AAR

21 159638

**ANALYTIC LINE CAPACITY MODEL**

This project extends the available analytic models of rail lines to improve their capability to predict the capacity of a line.

PERFORMING AGENCY: Queen's University, Canada, School of Business,  
 5.73.76

INVESTIGATOR: Petersen, ER  
 SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE:  
 1977 TOTAL FUNDS: \$39,000

ACKNOWLEDGMENT: Queen's University, Canada

21 159653

**INTERMODAL SYSTEM DEMONSTRATION**

Test and demonstrate new concepts in intermodal services on designated routes. The AAR will subcontract with railroads through competitive bidding and will provide management to monitor and coordinate demonstrations. It will also collect and analyze data and make a final report. Among techniques to be tested are piggyback trains providing direct origin-to-destination service without intermediate yarding; scheduled services with two or more departures daily, increased labor productivity; improved terminal connections; and specialized information and control systems to respond to market changes.

PERFORMING AGENCY: Association of American Railroads  
 INVESTIGATOR: Way, GH (Tel (202)293-4168)  
 SPONSORING AGENCY: Federal Railroad Administration

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1977  
 COMPLETION DATE: 1980 TOTAL FUNDS: \$1,300,000



22 052066

**FREEZING PROBLEMS DURING RAIL TRANSPORTATION**

Field summary 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.

**REFERENCES:**

Thermal Conductivity Measurements of Moist Bulk-Material Concentrates Under Freezing Conditions, Patterson, J

Development of a Mathematical Model of Freezing and Thawing in a Railcar, Oosthuizen, PH

**PERFORMING AGENCY:** Canadian Institute of Guided Ground Transport, Queen's University

**INVESTIGATOR:** Colijn, H

**SPONSORING AGENCY:** Canadian National Railways; Department of Transport, Canada; Queen's University, Canada

**STATUS:** Completed **NOTICE DATE:** Aug. 1977 **COMPLETION DATE:** Nov. 1976

**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 THE FREEZING OF BULK MATERIALS DURING RAIL TRANSPORTATION**

When moist materials E.G. copper and zinc concentrates coal are transported in railcars during winter, freezing of the material in the car can occur. This freezing can make the cargo difficult to discharge in order to evaluate means of overcoming the problem, it is important to be able to predict the extent of the freezing that will occur under a particular set of circumstances. The purpose of the present study is, therefore, the development of a simple numerical model that will allow such a prediction to be made. A series of computer models for various types of car, have, therefore, been developed and are being used to study the effect of various parameters on the degree of freezing. A supporting laboratory program has also been undertaken.

**REFERENCES:**

A Numerical Study of Freezing and Thawing of Bulk Materials During Rail Transportation, Oosthuizen, PH; Rush, CK, ASME, 75WA/HT-87, Nov. 1975

**PERFORMING AGENCY:** Queen's University, Canada, 3.49.76

**INVESTIGATOR:** Oosthuizen, PH (Tel (613) 547-6246) Rush, CK

**SPONSORING AGENCY:** Canadian Institute of Guided Ground Transport

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** May 1974 **COMPLETION DATE:** Dec. 1977 **TOTAL FUNDS:** \$9,660

**ACKNOWLEDGMENT:** CIGGT

22 083483

**ECONOMIC ANALYSIS OF THE UNITED STATES GRAIN EXPORTING SYSTEMS**

Evaluate alternative inventory and export policies with respect to: Market efficiency, price stability, producer and consumer utility, their effects on private state trading systems, servicing the export markets, and the effects of export embargoes on prices and market share. Use historical data to estimate and project demand and supply imbalance in world grain trade. Calculate the variability in supply and demand and surplus and deficits under alternative assumptions of world production and consumption. Develop models that will show the effects of alternative inventory policies on the size and variability of world grain surplus or deficit. Estimate the effects of alternative inventory policies on farm income, U.S. and world grain prices, and the variability of grain marketing firms. Estimate the costs and other economic effects of alternative policies and alternative ownership arrangements for given levels of inventory. Estimate the relationship between alternative inventory policies and volume and destination of exports. Further work was done on a study of grain marketing patterns by Indiana farmers. A survey of truck shipments of grain by Indiana country elevators for the 1973-74 marketing year was tabulated and preparation of a manuscript for publication was begun. Truck shipments accounted for 64 percent of total grain handled by country elevators in 1974-75, up from 58 percent in the 1968-69 marketing year. This was a continuation of a long time trend. A manuscript was prepared summarizing the results of a study of vertical coordination in cooperative grain marketing systems.

**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:** Jones, BF

**SPONSORING AGENCY:** Department of Agriculture

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1971 **COMPLETION DATE:** Sept. 1981

**ACKNOWLEDGMENT:** Purdue University (CRIS 0060205)

22 083506

**DETERMINE COSTS FOR DIFFERENT SYSTEMS FOR MARKETING POTATOES FROM THE GROWER TO THE RETAIL STORE**

Develop the least cost system(s) for handling, distributing, storing, processing and packaging potatoes by improving the efficiency for each function in the marketing systems. 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. This work has been divided into three phases. The first phase included the harvesting, loading the trucks or trailer, transporting the potatoes from the field to the packing shed and unloading at the packing shed. This phase of the total system study of marketing potatoes has been completed. By using a truck and trailer combination instead of a truck alone for harvesting, transporting and unloading potatoes at the packing plant, an 18 percent savings is realized or \$0.49 per ton. Projecting these savings to the 2-1/2 billion pounds of potatoes harvested in 1972, a savings of over \$600,000 could be realized. The second part of the study will analyze operations at the packing shed. Research was started in June 1974 and is now about 70 percent completed. The third phase of the study will be conducted at the receiving wholesaler's warehouse and will include delivery to the retail foodstore. Research on the third phase will begin in the first quarter of FY 76.

## REFERENCES:

A Cost Evaluation for Two Systems of Handling Bulk Potatoes from Field to Packing Shed, Volz, MD; Anthony, JP, Jr; Mongelli, RC, Oct. 1974

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: Aug. 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

Measure the cost for less-than-truckload (LTL) shipments of groceries from manufacturer to wholesaler and determine feasibility of reduced cost with a regional warehouse to store products of several manufacturers and ship full truckloads of grocery products from several manufacturers. Determine extent of less-than-truckload (LTL) receipts of grocery products at wholesale warehouses, measure labor productivity, detention charges, and other costs for LTL shipments. Develop a model based on actual productivity in receiving utilized truckloads of groceries, intermediate warehousing and transportation costs. Enlist the support and cooperation of the National American Wholesale Grocers Association, National Association of Food Chains, and Super Market Institute. Data were obtained from 129 food warehouse operators concerning truck receipts of grocery products. The typical warehouse received 60 percent of its groceries by carrier truck, 30 percent by railroad, and 10 percent by backhaul. Of carrier truck arrivals, 60 percent were full truckloads and 40 percent were less-than-truckload. The typical firm had received only 10 percent of its carrier truck receipts in unitized form although 92 percent of the firms had received products that were unitized on pallets and 28 percent had received products on slipsheets. Standard productivity in unloading trucks by handstacking cases on pallets and removing the unit load with a pallet jack averaged 5 tons per man-hour compared with 59 tons per man-hour for unloading unitized products. Efficiency of truck receiving can be improved by use of the following principles: (1) Schedule incoming truck receipts; (2) specific unitized loads when ever possible; (3) provide sufficient temporary storage area; (4) keep temporary storage clear as much as possible; and (5) provide proper type and quantity of materials handling equipment.

## REFERENCES:

Methods for Receiving Groceries by Truck Bouma, JC, Nat American Wholesale Grocers' Assoc, Chicago, Proceedings, Mar. 1975

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15864-001

INVESTIGATOR: Bouma, JC

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Nov. 1973 COMPLETION DATE: Nov. 1979

ACKNOWLEDGMENT: Current Research Information System (CRIS 0040668)

## 22 083516

#### CONTROL OF DAMAGE AND LOSS IN DISTRIBUTION

Find characteristics of commodities and items which are damaged in distribution, determine environment factors causing damage, propose methods of damage reduction and develop an economics of distribution loss control. Procure damage histories for specific commodities and items. Analyze package systems used in connection with damage history in the laboratory and in the field. Using established design procedures, redesign packages to reduce loss. Establish total economic advantages in use of redesigned package including resource use and the ecological impact. Using information assembled in case by case approach, establish generalities relating to damage control. Develop sub-projects to explore specific problems in the areas of cushion properties, distribution environment, item fragility and system evaluation procedures. Damage boundary technique applied to container survival. Conducting testing audit of specification properties of corrugated fiber board. Conducted material tests of plastic corrugated board.

## REFERENCES:

A Critical Analysis of Vibration Measurement of the Transportation Environment, Hausch, JR, Michigan State University, School of Packaging, Tech Rpt 23, Sept. 1975

PERFORMING AGENCY: Michigan State University, East Lansing, School of Packaging, MICL 03108

INVESTIGATOR: Goff, JW

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1971 COMPLETION DATE: July 1999

ACKNOWLEDGMENT: Michigan State University, East Lansing (CRIS 0060632)

## 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. A mail survey of Maine potato growers indicated that market information on potato prices and quantities was most frequently used in determining the quantity and variety of potatoes to plant, timing sales, and potato utilization. The most frequently used sources were radio, television,

dealers and brokers, and government agencies. A relationship between information use and performance was found where futures and historical prices, acreage, production, and fresh stocks estimates were used to determine time of year to sell potatoes. A conceptual algorithm for analyzing price and quantity data has been developed. Two statistical series concerning production and marketing data have been prepared. Analysis of truck shipment concerning availability of trucks from origins to destinations, and seasonality of movements of Maine potatoes continued. Greater percentage of shipments (74 crop) extended beyond Northeastern states. Over 90% moved over highway compared to 80-85% in 3 previous seasons. Truck shortages reported 7% of time, compared to 45 and 35% previous 2 seasons. Freight rates for Maine potatoes by truck vs. rail compared at current levels. Storage facilities data collection interrupted and delayed.

**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, Pelsue, NH, Jr, Maine University, Life Sciences & Agr. Experiment Station, V22 N4, Nov. 1974

Demand Relationships and Pricing Implications for Selected Potato Products, Pelsue, NH, Jr, American Potato Journal, V52 N2, pp 39-45, Feb. 1975

Utilization of Production and Marketing Information by Maine Potato Producers, Pelsue, NH, Jr, Maine University, Orono, Bulletin 716, July 1975

Marketing Characteristics in Shipments of Maine Tablestock Potatoes, 1966-1973, Johnston, EF; Pelsue, NH, Jr, Maine University, Orono, Report 172, Nov. 1975

Potato Statistics-Revised 1975 Pelsue, NH, Jr; Kalaw, T, Maine University, Orono, Report 171, Nov. 1975

**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:** Aug. 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. Research for improved transport of concentrated forage products is at a stage of development that waits for suitable densification machinery.

**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:** Aug. 1977 **START DATE:** Nov. 1973 **COMPLETION DATE:** Nov. 1978

**ACKNOWLEDGMENT:** Current Research Information System (CRIS 0040669)

**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. (1) Further testing was conducted on the Financial Simulator Model for Country Elevators. This computerized model has been designed to assist managers in the evaluation of long range plans for their firms. More efficient operations should result from the use of this management tool. (2) A bulletin which describes an Inventory Control Model for fertilizer Retailers was published. This model is designed to assist management in minimizing inventory holding costs. (3) Work was completed on a study of Financial Conditions Supporting Growth in Local Farmer Cooperatives. This study should assist managers of credit institutions in evaluating the growth potential of local cooperatives. A thesis has been written. A paper was presented at the 1977 American Agricultural Economics Asc. meeting. Two Departmental papers has been prepared.

**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

A Computerized Model for Retail Fertilizer Dealers Inventory Management, Devino, GT; Dever, LA, Jr, Missouri University, Agricultural Exp Station, S.R. 185, June 1976

**PERFORMING AGENCY:** Missouri University, Columbia, Department of Agricultural Economics

**INVESTIGATOR:** Devino, GT Moser, DE

**SPONSORING AGENCY:** Department of Agriculture

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** Jan. 1972 **COMPLETION DATE:** July 1977

**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 of 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. Studies on the long-term storage of beef quarters showed that after 14 days of storage, quarters which were washed with 200 ppm chlorine solution and wrapped with PUC film 12 hours postmortem sustained the lowest percent shrink--0.25 percent vs. 2.31 percent for unwrapped quarters, had the highest numerical subjective scores for muscle color, odor, and overall desirability and had the lowest mean bacterial counts after storage. Studies on vacuum-packaged fabricated cuts of beef showed that cuts packaged at high levels of vacuum had less surface discoloration, exhibited superior appearance of the fat cover, and had higher total desirability scores than fabricated beef cuts packaged at lower levels of vacuum. Studies designed to identify systems for protecting the quality and condition of beef shipped long distances have been developed using test fresh beef shipments from the West Coast of the U.S. to Alaska, Hawaii, and Japan.

**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: Aug. 1977 START DATE: June 1974 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Current Research Information System (CRIS 0041163)

#### 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. The two requirements of a successful pallet exchange system are guaranteed uniform-valued pallets and an agency to provide the guarantee to the pallet user. Pallet construction standards have been written and tested that insure that species and grades are compatible with the fastening system and that pallet production procedures assure uniform performance. The design objective is uniform performance in service, irrespective of the materials used. The grading and utility-rating standard establish uniform shock-performance classes; and account must be taken in design of the differences between the classes in order to build pallets that perform in a uniform manner. To insure equal quality in a pallet exchange program, the pallets should be produced and procured under the auspices of a third-party inspection and certification system. This third party would also be responsible for maintaining the value of the pallet during its life and managing the exchange pallet inventory. The time appears right for the establishment of a major pallet exchange program in the U.S.

#### 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

Design of Pallet Deckboard-Stringer Joints Part II: Reinforced Aspen Pallet Joints and Aspen Pallets, Stern, EG, VPI and State Univ, Wood Res & Wood Constr Lab, Bulletin 133, 24 pp, 1975

Recent Pallet Fastening Research can Reduce Pallet Costs, Stern, EG, VPI & State Univ., Wood Res & Wood Constr Lab, Bulletin 128, 8 pp, 1974

Tentative Nailing Standards for Warehouse and Exchange Pallets, Wallin, WB; Stern, EG, VPI & State Univ., Wood Res & Wood Constr Lab, Bulletin N129, 16 pp, 1974

PERFORMING AGENCY: Northeastern Forest Experiment Station

INVESTIGATOR: Martens, DG

SPONSORING AGENCY: Department of Agriculture, NE-4304

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Sept. 1967 COMPLETION DATE: May 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 response to a request from New York State lettuce growers and retail distributors, one test shipment of lettuce packed in 48-by 40-inch bulk bin-boxes was made from Oswego, N.Y., to Baltimore, Md. The multi-wall bin-box was constructed from two layers of double-wall corrugated fiberboard. The bin-boxes and the lettuce arrived in good condition, but the bin-boxes were difficult to deliver to and handle in retail stores. Additional tests were planned and conducted on the use of air-filled plastic bags and other cushioning materials for apples in loose-filled boxes. Laboratory tests conducted in the Yakima, Wash., Packaging and Transport Research Laboratory indicated that polyethylene-foam pads show enough promise to warrant further testing, but the plastic film (Surlyn/Mylar) bags failed to provide a satisfactory cushion because of their vulnerability to stem punctures and seal failures. A corrugated, rigid, plastic box (mixture of high-density and low-density polyethylene resin) was also evaluated for shipping celery and cut flowers. These boxes are being redesigned to give them additional strength needed in the physical distribution system.

#### 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: Aug. 1977 START DATE: Oct. 1968 COMPLETION DATE: May 1977

ACKNOWLEDGMENT: Current Research Information System (CRIS 0020042)

#### 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.

A study was initiated to compare the costs of two systems for handling prefabricated cuts of beef between the wholesale chain warehouse and retail stores. One system utilizes wire baskets stacked on a four-wheel dolly; the other utilizes cardboard boxes on pallets. The data-gathering stage is nearly complete and rough draft report should be initiated by June, 1975.

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute

INVESTIGATOR: Goulston, CL

SPONSORING AGENCY: Department of Agriculture, 1104-15864-005

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1974 COMPLETION DATE: Aug. 1979

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. Citrus fruit are not adequately cooled in mechanically refrigerated rail cars during warm weather. Cooperative arrangements were initiated with ARS, rail and citrus groups to modify the air distribution system of a rail car for test purposes. A reversed air flow system was developed by ARS for evaluation in this rail car application. A laboratory procedure was devised for the quantitative determination of benomyl, a fungicide used on citrus after harvest. The method is less accurate than existing methods but is faster, more convenient and useful when greater accuracy is not necessary.

## REFERENCES:

Recommendations for Exporting Florida Lemons Hale, PW; Houck, LG; Risse, LA, Citrus and Vegetable Magazine, V37 N7, 4 pp, Mar. 1976

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: Aug. 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, improving, and maintaining quality and condition of Texas 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. An experimental shipment of 10 van containers of Texas grapefruit (10,000 boxes) was exported to Rotterdam, The Netherlands. All containers were met at their destination points throughout Europe by ARS personnel. Experiment 1 consisted of 8 containers & compared 4 fungicide treatments, 2 box loading patterns and 2 types of refrigeration units. Container refrigeration units without a constant air flow feature did not reduce fruit temperatures quickly or uniformly throughout the load whenever a solid (in-register) loading pattern was utilized. Refrigeration units employing a constant air flow feature uniformly reduced temperatures to a constant level regardless of stacking pattern. Neither type of refrigeration unit reduced fruit temperatures from ambient as quickly as is desirable. Thus, precooling of all export fruit is highly recommended. Intermittent air flow units should not be used in combination with an in-register stacking pattern. No significant differences in decay nor increases in CO (2), O(2) or C(2)H(4) (ethylene) were found among treatments. Moisture content of cartons increased equally in all containers. Carton failure and fruit deformation tended to be greater in the air flow stacking pattern. Experiment 2 consisted of 2 containers modified to force cooled discharge air directly through the boxes of fruit.

PERFORMING AGENCY: Agricultural Research Service, Nematology Research Laboratory

INVESTIGATOR: McDonald, RE

SPONSORING AGENCY: Department of Agriculture, 7202-15880-002

STATUS: Active NOTICE DATE: Aug. 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. Progress was made toward improved ability to respond effectively to requests for marketing margins and cost components information. Close working relationships were maintained with VPI on cooperative work relating to costs of crushing and manufacturing salad dressing and mayonnaise. A cost simulation model, developed at VPI is now operational for crushing soybeans, refining soybean oil, and manufacturing margarine, cooking oil, mayonnaise, and shortening. These models along with information now in the FEDS provide a basis for estimating costs from the production of soybeans through the processing sector. The overall system can also provide information and resource use including capital, labor, energy, etc. The system was used during the year to develop a staff report on energy uses in the crushing sector.

## REFERENCES:

US Situation for Oil Crops-Soybeans, Cottonseed, Peanuts, Sunflower, Safflower and Other Oilseeds, Doty, Ho, Jr, Res to Meet U.S. & World Food Needs, ARPAC Conf, Vol 1, pp 150-173, July 1975

Decision Making in Oilseed Processing Doty, Ho, Jr, Oil Mill Gazetteer, pp 20-26, Aug. 1975

A Representative and Deterministic Cost Component Model of the U.S. Vegetable Oil Industry, Lamm, RM, Jr; Johnson, JM, VPI and State Univ in Coop with Econ Res Service, Bulletin 107, 93 pp, Dec. 1975

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: Aug. 1977 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. Research on world relationships in the oil crops complex continued with the preparation of a paper for the World Soybean Research Conference held at the University of Illinois. World historical data were collected and used to estimate intercorrelations among several fats and oils to estimate consumption functions for fats and oils in several countries. Staff papers were prepared which analyzed alternative peanut policy proposals related to changes in legislation and administrative provisions of current law. Progress was made on the compilation and analysis of survey data on the capacity of the fats and oils refining industry. A 100-percent enumeration of the refining industry was completed and the data analyzed to determine the total and regional capacity of the oil refining industry. This work resulted in the publication of a special article in the Fats and Oils Situation. Data tables on energy used by type of energy, by month, and by State for the 1974 soybean, peanut, and flaxseed crops were prepared.

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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

Cost of Producing Soybeans in the US, 1974 Walter, AS, Economic Res Service, FOS-281 pp 34-40, Feb. 1976

Costs of Production for Soybeans, Peanuts and Flaxseed for 1974, 75 and 76, Walter, AS; Garst, GD, Economic Res Service, Bulletin 106 pp 28-31, Apr. 1976

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: Aug. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information System (CRIS 0041590)

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

The study seeks to improve the efficiency of the transportation and distribution of perishable foods by identifying both implementable short run opportunities and potential long term changes in the industry. The study is divided into four parts. The first two seek to understand and describe the composition and functioning of the industry and to identify the cost and service parameters of its transportation and distribution system. The latter two stages will identify alternative transportation and distribution systems and investigate possible long run changes in technology.

Subcontractor: Reebie Associates, P.O. Box 1436, 200 Railroad Avenue, Greenwich, Connecticut 06830.

REFERENCES:

Transportation & Distribution of Fresh Fruits and Vegetables. A Bibliography, Schrier, E; Ainsworth, DP, NTIS, Apr. 1976

PERFORMING AGENCY: Manalytics, Incorporated

INVESTIGATOR: Schrier, E (Tel (415) 788-4143) Ainsworth, DP Hill, SG

SPONSORING AGENCY: Federal Railroad Administration; National Bureau of Standards, Department of Commerce

RESPONSIBLE INDIVIDUAL: Newkirk, JL (Tel 202-426-0771)

Contract DOT-FR-65024

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$731,746

ACKNOWLEDGMENT: FRA

22 130967

#### CONTAINERIZED ORDNANCE TRANSPORTATION EQUIPMENT

Explore new concepts and techniques for shipping containerized naval ordnance on existing DOD/commercial flatbed trailers and rail flatcars. Establish feasibility and develop technological guidelines for future engineering of portable adapters for locking standard cargo containers to flatbed trailers and railcars. Investigate the feasibility of permanent and temporary modifications to existing equipment to meet containerized ordnance transportation requirements.

PERFORMING AGENCY: Department of the Navy, Weapons Handling Laboratory

INVESTIGATOR: Wilner, I

SPONSORING AGENCY: Naval Sea Systems Command, Department of the Navy, DNS97250

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQN597250 1)

22 130968

#### CONTAINERIZED ORDNANCE TRANSPORTATION EQUIPMENT

Explore concepts and techniques for internal restraint systems and dunnaging techniques for qualifying commercial containers for intermodal shipment of ordnance. Determine strength characteristics of the major types of commercial containers currently available in industry. Investigate available restraint methods for possible application. Design new restraint systems where required. Test and evaluate prototype containers to determine feasibility of qualifying commercial containers.

PERFORMING AGENCY: Department of the Navy, Weapons Handling Laboratory

INVESTIGATOR: Delatush, J

SPONSORING AGENCY: Naval Sea Systems Command, Department of the Navy, DNS97251

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQN597251 1)

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 wastes. 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 REPORT:** Optimal solutions for the grain and fertilizer distribution and transportation systems for the entire state of Iowa have been obtained. These solutions have been used to compute benefit cost ratios for upgrading 71 branch rail lines in Iowa.

**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:** Aug. 1977 **START DATE:** July 1974 **COMPLETION DATE:** June 1979

**ACKNOWLEDGMENT:** Smithsonian Science Information Exchange (GY 65178 1)

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 STORAGE**

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. A sampler for use in automatic dump scales was modified for the Federal-State Inspection service because new regulations and use of bulk container units made existing sampling methods inadequate. An investigation of dimensional changes in peanuts as moisture is removed during drying indicated that most of the change occurs as moisture is reduced down to 15%. Below 15% moisture changes are measurable but not significant. Shelled and in-shell Virginia, runner and Spanish peanuts were free-fall impacted upon wood, steel, concrete, and peanut surfaces. Peanut temperatures of 76 deg F and 35 deg F were used. Factors such as split kernels, foreign material, loose shelled kernels, etc. were used to evaluate damage. Damage were significant when drop heights exceeded 12 feet for in-shell peanuts and 2 feet for for shelled peanuts. The 35 deg F temperature peanuts damaged more easily than the 76 deg F peanuts. Peanuts impacted on peanuts caused less damage than other impact surfaces and some difference in damage was noted between peanut types. A new method of packaging shelled peanuts is being investigated cooperatively by container Corporation of America, Insects Investigations Lab at Savannah and the Quality and Engineering Labs of the National Peanut Research Laboratory. The analysis of the 3-month samples indicates no change in quality.

**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

Damage to Peanuts from Free Fall Impact Slay, WO, J Amer Peanut Res and Educ Assoc., 1975

**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:** Aug. 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 slipsheets 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. **PROGRESS REPORT:** Under commercial packinghouse conditions, tested the assembly and filling with bagged grapefruit, a two-piece, 275-lb-test corrugated bulk bin using Signode angleboard and nylon strapping. Additional holding and shipping tests are needed before conclusions can be made. This test showed it is physically feasible and economical to pack bagged grapefruit in an inexpensive bulk-bin concept which can be distributed to and merchandised directly from retail produce departments of major supermarkets. Tested under commercial packinghouse conditions, the assembly, filling, and gassing of tomatoes in wooden bulk pallet bins compared with conventional practices of using fiberboard cartons. Results indicate similar ripening pattern of mature green tomatoes compared with ripening in conventional cartons. Additional replications of holding tests are necessary before sound conclusion can be made.

**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:** Aug. 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. **PROGRESS REPORT:** Lettuce: A new carton with outside dimensions of 20-3/4 x 11-1/4 x 16 inches has been developed, which can be unitized on inexpensive slip sheets and mechanically loaded in rail cars and trucks. About the same amount of lettuce in the new carton size can be loaded in trucks as with the conventional carton, but about 6 thousand more head can be loaded in rail cars. Additionally, about 50 percent less lettuce is lost due to physical damage in the new carton. Corrugated fiberboard, solid fiber, high density polyethylene, and polypropylene slip sheets have been adequate for handling lettuce when the fork truck

driver was competent. Use of bulk bins has resulted in good arrivals and an adequate load can be obtained in rail cars and trucks when bins are handled on slip sheets instead of pallets. Stone Fruits: Peaches and nectarines shipped in jumble-filled 35-pound boxes were equal in quality to those shipped in the conventional jumble-filled 25-pound box or two-layer place-packed box. Bliss-style corrugated fiberboard boxes and tray-style corrugated fiberboard boxes performed equally well.

#### **REFERENCES:**

Unitized Handling of Western Iceberg Lettuce Hinds, RH; Hinsch, RT, Intl Conf Handling Perishable Agr Commodities, Mich., Proceedings (27th) pp 130-33, 1975

A Mechanical Handling System for Lettuce--Can It be Done?, Hinsch, RT; Hinds, RH, Produce Marketing Assoc. Yearbook, 3 pp, 1975

Packing and Shipping Mechanically-Harvested Lettuce Hinsch, RT; Rij, RE, US Dept of Agriculture, Res Report 1049, 7 pp, 1976

Current Practices & Trends in Marketing Western Iceberg Lettuce in Relation to Other Produce, Rij, RE; Hinds, RH; Hinsch, RT; Harris, CM, US Dept of Agriculture, Res Report 1052, 9 pp, 1976

Temperature Requirements for Shipping California Green Peppers, Lipton, WJ, Produce Marketing Assoc. Yearbook, 3 pp, 1975

**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:** Aug. 1977 **START DATE:** Oct. 1969 **COMPLETION DATE:** July 1979

**ACKNOWLEDGMENT:** Current Research Information Service (CRIS-0020846)

**22 138378**

#### **ALTERNATIVE STRUCTURES FOR INCREASING EFFICIENCY IN INTER-AND INTRA-REGIONAL GRAIN MARKETING SYSTEMS**

**OBJECTIVES:** Indicate ways to increase the economic efficiency of grain marketing, transporting and processing following dramatic changes since 1972 in marketing institutions, operational structure and policies related to industry. Evaluate the impact of alternative transportation rate structures on the organization of the grain industry. Examine alternative national grain inventory policies and their effects on market organization and performance. Based on results develop a set of recommendations for improving efficiency and/or reducing costs of inter- and intra-regional marketing of grain. **APPROACH:** Georgia will participate in the work of four objectives as outlined in the regional project statement. The work will include a survey of grain farms serving the Southern region to determine changes in marketing functions related to movement and storage of grain; the development of grain transfer costs for alternative modes of transportation; an analysis of grain inventory policies on storage and transportation needs; and recommendations from data obtained to guide grain firms on needed marketing facility investments under alternative situations. **PROGRESS REPORT:** Estimated costs of handling grain for various firm sizes in Georgia. Initial estimates of grain utilization by grain and class of livestock for several years in Georgia. Have begun revising an LP model of grain flows for the state of Georgia. This and related work has been done in cooperation with regional project SM-42. Presented seminar and several talks to civic groups on grain situation and foreign trade.

#### **REFERENCES:**

75 corn Crop Uncertain Bateman, WL, Farmers and Consumers Market Bulletin, Vol. 61 No. 4, Jan. 1975

**PERFORMING AGENCY:** Georgia Agricultural Experiment Station, Agricultural Economics Department, GEO01185

**INVESTIGATOR:** Anderson, RF Huang, CL

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1974 **COMPLETION DATE:** Sept. 1981

**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 be 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 138390

**IMPROVING RELATIVE HUMIDITY LEVELS AND CONTROL IN REEFER VAN TRAILERS AND CONTAINERS**

The aim of the project is to determine prevalent relative humidity levels and control in conventional equipment; develop methods/systems to optimize the RH levels and control. The approach will be to: measure and record relative humidity levels in a statistically valid sample of reefer van cargo spaces, loaded and unloaded; evaluate data; define the prevalent functional level and control parameters; postulate the causes for deviation from the optimum levels; hypothesize the methods/systems required to optimize the levels and control; empirically test the hypothesis on prototype equipment; report the results and recommend methods/systems.

PERFORMING AGENCY: Department of Agriculture, Horticultural Research Laboratory, ARS 7606

INVESTIGATOR: Goddard, WF

SPONSORING AGENCY: Department of Agriculture, 7606-15840-002

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1975 COMPLETION DATE: June 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0042497), Smithsonian Science Information Exchange (GU 42497 1)

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: Mar. 1977 START DATE: Apr. 1976 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$630,000

ACKNOWLEDGMENT: FRA, TRAIS

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 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

22 153666

**LASH AND OTHER INTERMODAL SERVICES IN THE PACIFIC NORTHWEST EXPORT DISTRIBUTION SYSTEM**

Identify potential economies that could be obtained from movement of agricultural and forest products from the Pacific Northwest via the Columba-Snake navigation system into overseas markets by recently innovated intermodal transportation systems such as LASH, standard intermodal containers, and ocean-going barges. Identify products that would lend themselves to movement from the Pacific Northwest into foreign markets via the above transportations system and determine least cost routes and modes of moving these products.

PERFORMING AGENCY: Idaho University, Moscow, Department of Agricultural Economics, CSRS IDA

INVESTIGATOR: Jones, JR

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, IDA00719

Contract 616-15-85

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Apr. 1976 COMPLETION DATE: Sept. 1980

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070665)

22 153674

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS**  
 Estimate rural freight transportation requirements to 1985 and 1990. Estimate the optimal rural freight transportation, storage, and distribution system.

PERFORMING AGENCY: Illinois University, Urbana, Department of Agricultural Economics, CSRS ILLU  
 INVESTIGATOR: Hill, LD Hoffman, L  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, ILLU-05-0344

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070435)

22 153695

**INFORMATION FOR ORDERLY CHANGE IN THE FEED AND GRAIN INDUSTRY**

OBJECTIVE: Develop an efficient grain marketing structure for small area of Indiana that can be applied state wide. Evaluate effects of DOT railway abandonment on grain terminals location and elevator structure. APPROACH: Analysis information on number, size, and condition of grain and feed facilities. Develop criteria for efficient structure and flow pattern for industry. Evaluate number and location subterminals by computer program. PROGRESS: Large increases in grain production results in extra grain being marketed off the farm. "Big John" hopper cars and multiple freight rates developed as the export market for grain increased. Special equipment and facilities were required to store the grain and load the hopper cars. Several grain companies are constructing subterminal elevators to meet the increased demand to railroad abandonment. Trucks cannot transport an adequate amount of grain during the harvest rush to keep the country elevators in operation. An analytical study was undertaken to determine the number of subterminals needed to efficiently market grain in a heavy grain producing area. An assessment of the effects of variation in export demand upon the location and numbers of subterminals was included. This study provides a method of simulating the impact of investments in subterminals at specific locations before the money is invested. The impact of operational changes can also be assessed. It assesses the overall competitive situation and can be a great help in preventing over-investment of sunk capital. A computer program was developed, utilizing both Linear and Mixed Integer Programming, to break the large problem into smaller, more manageable units. The objective function minimized the total handling costs of marketing grain. The computer program can be adapted to use on other plant location type problems. The study indicated a potential savings of over four million dollars could be achieved annually due to decreased grain handling.

PERFORMING AGENCY: Purdue University, Agricultural Experiment Station  
 INVESTIGATOR: Uhrig, JW  
 SPONSORING AGENCY: Department of Agriculture, Indiana Cooperative State Research Service

STATUS: Active COMPLETION DATE: Oct. 1976

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 32426 7)

22 153703

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION**

Estimate rural freight transportation requirements to 1985 and 1990. Estimate the optimal rural freight transportation, storage and distribution system. Evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers, receivers and rural communities.

PERFORMING AGENCY: Iowa State University, Ames, Department of Economics, CSRS IOW  
 INVESTIGATOR: Baumel, CP  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, IOWO2173

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070220)

22 153718

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS**

Estimate rural freight transportation requirements to 1985 and 1990, estimate the optimal rural freight transportation, storage and distribution system, evaluate the economic effects of alternate railroad ownership and financial policies.

PERFORMING AGENCY: Kansas State University, Department of Agricultural Economics, CSRS KAN  
 INVESTIGATOR: Sorenson, LO  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, KAN00966

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070301)

22 156972

**POTENTIAL IMPACTS OF CONTAINERIZATION AND INTERMODAL MOVEMENTS OF AGRICULTURAL COMMODITIES AND PRODUCTS**

This study will evaluate the potential for and assess the economic impact on shippers, carriers, and receivers resulting from increased use of containerization and intermodal movements of agricultural commodities and product inputs. APPROACH: This is a basic line study directed to one area of the abandonment question (i.e. alternatives for meeting increasing freight transportation needs of rural areas). The information developed in this effort will furnish guidelines to decision makers relating to available alternatives for moving inbound and outbound freight in rural areas confronted with rail abandonment. Primary emphasis of this study will be devoted to those rural communities currently receiving rail service on light density on branch lines in Texas and will focus on potential alternatives available to users in rural areas and the benefits and costs of implementing container and intermodal plans.

PERFORMING AGENCY: Texas A&M University, Agricultural Experiment Station, Tex-616-15-90  
 INVESTIGATOR: Lamkin, JT Owensby, RM  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

Contract 616-15-90

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Apr. 1976 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: Current Research Information Service

22 157092

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS**

To estimate the optimal rural freight transportation, storage and distribution system. Evaluate the economic effects of alternative railroad ownership and financial policies. Evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers, receivers and rural communities.

PERFORMING AGENCY: Wisconsin University, Madison, Department of Meat and Animal Science, CSRS WIS  
 INVESTIGATOR: Vilstrup, RH  
 SPONSORING AGENCY: Department of Agriculture, WIS02268

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0071499)

22 159639

**NUMERICAL EVALUATION OF PROPOSED THUNDER BAY  
COAL THAW SHED**

A numerical computer model based on the assumption of one-dimensional heat conduction has been used to investigate the performance of the proposed Thunder Bay thawshed. In the proposed thawshed, the sides and bottoms of the cars would be thawed using infrared heaters while the ends of the cars would be thawed by convective heat transfer, the air temperature in the shed being 180 degrees F. The effect of wuch parameters as the intensity of infrared radiation, convective heat transfer coefficient, initial coal temperature, and the amount of thawing produced in the shed, have been investigated. The effect of these parameters on the surface temperature has also been investigated. In addition, the effects of changes in thawshed layout have been investigated.

PERFORMING AGENCY: Queen's University, Canada, 8.72.76  
 INVESTIGATOR: Oosthuizen, PH (Tel 547-6246)  
 SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

STATUS: Completed NOTICE DATE: Aug. 1977 COMPLETION DATE:  
 July 1977 TOTAL FUNDS: \$2,100

ACKNOWLEDGMENT: Queen's University, Canada

22 159640

**EVALUATION OF POTENTIAL DAMAGE TO RAILCARS  
DURING THAWING**

To test infrared heaters as to radiant characteristics, fuel effieicncy, and general suitability for car thawing; to evaluate potential damage to brakehoses and ACI labels during thawing; and to evaluate the hazard of dust explosions in thawing sheds for railcars carrying coal.

**REFERENCES:**

Experimental Investigation of Possible Railcar Damage During Thawing and Infrared Heater Evaluations, Becker, HA, June 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport,  
 8.69.76

INVESTIGATOR: Becker, HA (Tel (613)547-3024)

SPONSORING AGENCY: Canadian National Railways; Canadian Pacific

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: Jan.  
 1977 COMPLETION DATE: July 1977 TOTAL FUNDS: \$10,000

ACKNOWLEDGMENT: Queen's University, Canada

22 159641

**VALIDATION OF A MATHEMATICAL MODEL OF THE  
FREEZING OF COAL DURING RAIL TRANSPORTATION**

A test in which the temperature variation in railcars containing coal was measured during a winter journey was undertaken. A standard Gondola and a Bathtub Condola car were loaded with coal from a mine in the Crow's Nest Pass area. Thermocouple probes were inserted into the coal and each car and were used to measure the temperature variation in the coal while the cars were being transported to thunder bay and while they were standing at thunder bay the measured temperature variations were then compared with the predictions given by a computer model.

PERFORMING AGENCY: Queen's University, Canada, 3.24.73

INVESTIGATOR: Oosthuizen, PH (Tel 547-6246)

SPONSORING AGENCY: Canadian National Railways; Canadian Pacific

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: Dec.  
 1977 TOTAL FUNDS: \$26,000

ACKNOWLEDGMENT: Queen's University, Canada

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: Department of Transportation, Office of Environment, Safety and Consumer Affairs

RESPONSIBLE INDIVIDUAL: Crecco, RF (Tel (202)426-4298)

IA AS-40066

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1974 TOTAL FUNDS: \$2,000

ACKNOWLEDGMENT: Office of Environment, Safety and Consumer Affairs

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, and a users' guide is under development.

**REFERENCES:**

Criteria for Evaluating Alternative Transit Station Design Hoel, LA; Demetky, MJ; Virkler, MR, Feb. 1976

Methodology for the Design of Urban Transportation Interface Facilities, Hoel, LA; Demetky, MJ; Virklev, MR, Dec. 1976

PERFORMING AGENCY: Virginia University, Department of Civil Engineering

INVESTIGATOR: Hoel, LA Demetky, 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: Aug. 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 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 059225

**COMPUTER-GENERATED FILM DERIVED FROM TRANSIT STATION SIMULATION MODEL (USS)**

A transit station simulation model (USS) is a mathematical model designed to evaluate transit station designs to determine whether a given layout achieves the design objectives of providing enough space for pedestrian movement, providing enough service facilities, and connecting these areas and facilities in the most efficient manner. The objective which can be circulated to potential users of (USS) to inform them of the existence and nature of the transit simulation model.

PERFORMING AGENCY: Aviation Simulation International  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6701  
 RESPONSIBLE INDIVIDUAL: Schiff, S (Tel (617)494-2000)

Contract DOT-TSC-1210 (FFP)  
 STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$3,606

ACKNOWLEDGMENT: TRAIS (R6701)

23 059246

**URBAN TRANSIT PLAN EVALUATION**

The objective is to compile and condense the materials and results of the transportation planning process in a city pertinent to an UMTA review of transportation system implementation plans. Further, UMTA is interested in determining the response of communities to the Transportation Improvements Programs (TIP) guidelines.

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PERFORMING AGENCY: Peat, Marwick, Mitchell and Company  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6708  
 RESPONSIBLE INDIVIDUAL: Mergel, J (Tel (617) 494-2000)

Contract TSC-1253

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: June 1976 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$21,628

ACKNOWLEDGMENT: TRAIS (R6708)

23 059715

**REPLACEMENT OF THE FRANKFORD ELEVATED LINE**

Philadelphia's Frankford El is an electrified elevated rail rapid transit line. It connects directly with the subway in the central business district and after passing through mixed urban and light industry areas ends at a major transit bus terminal. The El is over 55 years old and scheduled for replacement within the next ten years. The objective is to have students develop a set of innovative design and implementation plans for the replacement of the Frankford El. The emphasis is on innovation since the objective is the development of new concepts or of new applications or combinations of "old" ideas.

PERFORMING AGENCY: Pennsylvania University, Philadelphia  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6577T

Contract DOT-TSC-1267

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$8,098

ACKNOWLEDGMENT: TRAIS (R6577T)

23 059716

**REPLACEMENT OF THE FRANKFORD ELEVATED LINE**

Philadelphia's Frankford El is an electrified elevated rail rapid transit line. It connects directly with the subway in the central business district and after passing through mixed urban and light industry areas ends at a major transit bus terminal. The El is over 55 years old and scheduled for replacement within the next ten years. The objective is to have students develop a set of innovative design and implementation plans for the replacement of the Frankford El. The emphasis is on innovation since the objective is the development of new concepts or of new applications or combinations of "old" ideas.

PERFORMING AGENCY: Temple University  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6577T

Contract DOT-TSC-1268 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$7,785

ACKNOWLEDGMENT: TRAIS (R6577T)

23 059717

**STUDENT DESIGNS OF FRANKFORD EL REPLACEMENT**

Philadelphia's Frankford El is an electrified elevated rail rapid transit line. It connects directly with the subway in the central business district and after passing through mixed urban and light industry areas ends at a major transit bus terminal. The El is over 55 years old and scheduled for replacement within the next ten years. The objective is to have students develop a set of innovative design and implementation plans for the replacement of the Frankford El. The emphasis is on innovation since the objective is the development of new concepts or of new applications or combinations of "old" ideas.

PERFORMING AGENCY: Villanova University  
 SPONSORING AGENCY: Transportation Systems Center, Department of Transportation  
 RESPONSIBLE INDIVIDUAL: Scott, HP (Tel (617) 494-2000)

Contract DOT-TSC-1266 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Jan. 1977 TOTAL FUNDS: \$7,998

ACKNOWLEDGMENT: TRAIS

23 059862

**DEVELOPMENT OF A TIME-CALIBRATED SELF-CANCELLING TICKET**

Self-cancelling tickets would be purchased by motor vehicle operators who would activate the tickets and display them on their vehicle windshields to show that they had paid to use the roads in the designated area. After a predetermined length of time the ticket would change color indicating that the ticket had cancelled itself. Additionally, self cancelling tickets could quicken traffic flow through toll stations by allowing for visual identification of activated tickets. Also, these tickets could be used to regulate parking time eliminating the need to purchase and install parking meters.

PERFORMING AGENCY: Little (Arthur D), Incorporated  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, IT-06-0125

Contract DOT-UT-60005 (CPFF)  
 STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$82,173

ACKNOWLEDGMENT: TRAIS (IT-06-0125)

23 059919

**STUDY OF LOGIT ANALYSIS OF RAPID TRANSIT ACCESS CHOICES**

The project will provide an Analysis of Rapid Transit Access Choices by the undertaking of six tasks: 1) Choose Test Sites considering origin-destination data base, representation of rail and bus rapid transit; 2) organize and finalize a data base by processing files for study sites, 3) utilize the task 2 data base to aid in the derivation of disaggregate behavioral models of rapid transit access mode choice behavior; 4) analyze task 3 models as an attempt to explain variations in model parameters; 5) evaluate the application of the logit models in rapid transit modeling and planning by considering issues other than transferability; 6) document the study as a comprehensive analysis of the rapid transit access planning manual as originally planned.

PERFORMING AGENCY: Virginia University  
 INVESTIGATOR: Hoel, LA  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, VA-11-0005  
 RESPONSIBLE INDIVIDUAL: Levinsohn, D (Tel (202) 426-9271)

Grant VA-11-0005  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$98,976

ACKNOWLEDGMENT: TRAIS (VA-11-0005)

23 059921

**CORRIDOR PLANNING ANALYSIS**

The focus of the research is on modeling trip distributions and modal split patterns within major urban corridors. The models will be designed for three types of applications: 1) as inputs in the early stages of planning for major capital improvements; 2) evaluation of low capital cost alternatives and; 3) providing market information.

PERFORMING AGENCY: Illinois University, Chicago  
 INVESTIGATOR: Sen, A  
 SPONSORING AGENCY: Urban Mass Transportation Administration, Department of Transportation, IL-11-0008/2  
 RESPONSIBLE INDIVIDUAL: Paules, G (Tel (202)426-9171)

Grant IL-11-0008/2  
 STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$54,997

ACKNOWLEDGMENT: TRAIS (IL-11-0008/2)

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 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: Ames Research Center, National Aeronautics and Space Administration  
 INVESTIGATOR: Hornby, H  
 SPONSORING AGENCY: Ames Research Center, Aeronautics and Space Technology Office, NASA, 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.

REFERENCES:

Perceptions of Passenger Service. A Case Study of a Change in Train Frequency, Turner, RE, Jan. 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport  
 INVESTIGATOR: Turner, RE (Tel (613)547-2736)  
 SPONSORING AGENCY: Canadian National Railways  
 RESPONSIBLE INDIVIDUAL: Spack, R (Tel (514)877-4126)



**Contract**

STATUS: Completed NOTICE DATE: Apr. 1977 START DATE: Apr. 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$20,550

ACKNOWLEDGMENT: CIGGT

**23 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: Aug. 1977 START DATE: Mar. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$20,600

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5765)

**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 CSS&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

**23 156666****IMPROVEMENT OF NORTHEAST CORRIDOR RAIL PASSENGER SERVICE**

A study of the state and federal roles in improving rail passenger service in the Northeast Corridor with particular emphasis upon the "Empire State Corridor" from New York City to Buffalo.

**REFERENCES:**

The Crisis in Rail Passenger Service in New York State: A Matter of Concern, New York State Select Senate Committee on Transportation, 1974

PERFORMING AGENCY: New York State Legislature, Select Senate Committee on Transportation

INVESTIGATOR: Mitchell, M (Tel (518) 472-3333) Zimmerman, JF

SPONSORING AGENCY: New York State Legislature, Select Senate Committee on Transportation

RESPONSIBLE INDIVIDUAL: Mitchell, M (Tel (518) 472-3333) Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1974

ACKNOWLEDGMENT: New York State Legislature

**23 156668****LIGHT RAIL TECHNOLOGY**

A study of the possible use of Light Rail in Nassau County: A Demonstration Project.

PERFORMING AGENCY: New York State Legislature, Select Senate Committee on Transportation

INVESTIGATOR: Mitchell, M (Tel (518) 472-3333) Zimmerman, JF

SPONSORING AGENCY: New York State Legislature, Select Senate Committee on Transportation

RESPONSIBLE INDIVIDUAL: Mitchell, M (Tel (518) 472-3333) Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1977

ACKNOWLEDGMENT: New York State Legislature

**23 157604****INTERCITY RAIL PASSENGER ENERGY EFFICIENCY**

The objective of this study was to develop intercity rail demand models to forecast changes in rail ridership in the NYC-Buffalo Corridor. After a literature search and data collection a two-stage modeling process was selected. Total city-pair traffic by purpose is forecast using simple gravity formulations. The Rail Share is then estimated using binary logit competition models in which rail competes differentially with air, auto and bus modes. Rail service and terminal quality variables, are included, as well as time, cost and frequency. Pivot point analysis is used to increase the accuracy of the forecasts.

**REFERENCES:**

Intercity Passenger Demand Models: State-of-the-Art Hartgen, DT; Cohen, GS, New York State Department of Transportation, Preliminary Research Rpt 112

New York State Intercity Travel Data Erlbaum, NS, New York State Department of Transportation, Preliminary Research Rpt 112, 1975

Intercity Rail Patronage in the NYC-Buffalo Corridor Models and Forecasts, Cohen, GS; Erlbaum, NS; Hartgen, DT, New York State Department of Transportation, Preliminary Research Rpt 115

PERFORMING AGENCY: New York State Department of Transportation, Planning Research Unit, Z3.F

INVESTIGATOR: Hartgen, DT (Tel (518) 457-6920) Erlbaum, NS Cohen, GS

SPONSORING AGENCY: New York State Department of Transportation, Planning Division; Department of Transportation

RESPONSIBLE INDIVIDUAL: Hartgen, DT (Tel (518) 457-6920)

Contract P00731802 UC

STATUS: Completed NOTICE DATE: June 1977 START DATE: Oct. 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$22,000

ACKNOWLEDGMENT: New York State Department of Transportation

**23 159652**

### **NORTHEAST CORRIDOR TRANSPORTATION REPORTS**

Under Section 703(1)(E) of the Railroad Revitalization and Regulatory Reform Act in 1976 the following studies are required: (1) Financial and operating results of the intercity rail passenger service established under the

Northeast Corridor Project; (2) Cost-Benefit analysis of improving various modes to meet future Northeast Corridor intercity passengers transportation needs; (3) Engineering, financial and market demand feasibility of establishing rail trip times of 2-1/2 hours between Washington and New York and 3 hours between New York and Boston.

PERFORMING AGENCY: Federal Railroad Administration

SPONSORING AGENCY: Federal Railroad Administration, Northeast Corridor Project Office

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1976 COMPLETION DATE: Feb. 1982

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: Boone, JW (Tel 202-426-9682)

STATUS: Active NOTICE DATE: Aug. 1977

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.

**REFERENCES:**

Freight Car Clearinghouse Experiment: An Interim Report, AAR, ADD Systems, Aug. 1975, RRIS 21 139446, 7701

Freight Car Clearinghouse Experiment-Evaluation of the First Year of Operation, AAR, Pub R-259, ADD Systems, June 1976, RRIS 21 153370, 7702

Evaluation of the RAILBOX Experiment and its Impact on Boxcar, AAR (In preparation)

Interim Eval of an Expanded Freight Car Clearinghouse AAR (In preparation)

Impact of AAR and ICC Orders and Directives upon the Freight Car Cycle, AAR (In preparation)

An Analysis of the Impact of Car Condition upon the Freight Car Cycle. Case Studies, AAR (In preparation)

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: Completed NOTICE DATE: Aug. 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) 472-7280)

STATUS: Active NOTICE DATE: Aug. 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: Aug. 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 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-4002  
 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) 472-7280)

Contract DOT-FR-T5192  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1976 TOTAL FUNDS: \$22,000

ACKNOWLEDGMENT: FRA

#### 24 148805 COST-BENEFIT ANALYSIS OF RAILROAD CONSOLIDATION IN CORRIDORS OF EXCESS CAPACITY

The first phase of this study addressed the question of the nationwide scope (outside of the Northeastern Region) of redundant mainline railroad facilities. A total of 55 mainline corridors are identified as appearing to have redundant mainlines. The second phase of this study involves the development of procedures for determining the effects of railroad consolidation on the full range of interests, including railroad companies, railroad industry, railroad capital requirements, railroad labor, rail users, local communities, and energy consumption, and the application of these cost-benefit procedures to two actual corridors which were identified as having potential for mainline consolidation. The documentation of the procedures and of the case study applications are intended to serve as a guide for evaluating actual consolidation proposals.

#### REFERENCES:

Railroad Mainline Corridors with Operational Consolidation Potential Outside the Northeast, CONSAD Research Corporation, Sept. 1976

PERFORMING AGENCY: CONSAD Research Corporation  
 INVESTIGATOR: Roszner, E (Tel (412) 363-5500) Hillegas, BD 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: Apr. 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$50,415

ACKNOWLEDGMENT: CONSAD Research Corporation

#### 24 152647 THE ASSESSMENT OF TECHNOLOGICAL CHANGE IN REGULATED INDUSTRIES

The objective of this research project is to develop analytic methods for assessing the impact of regulation on technological change. The approach will be to estimate the impact of regulation on productivity through its impact on technological change by controlling for all major factors other than regulations that influence productivity. The research will compare the performance of selected U.S. and Canadian railroads to estimate the efficiency losses due to regulation in the U.S. The approach will be founded on the use of the Canadian railroads' record. By controlling for those factors other than regulation that affect productivity levels and rate of change, the differences in the Canadian and U.S. records can be attributed to differences in regulation. This research will employ several different methods for examining the impact of regulation on productivity in regulated industry. First, an index number approach will be used looking at aggregate time series data. Second, several econometric modeling techniques will be used, employing cross-section analysis of U.S. and Canadian railroads, time-series analysis of both nations' railroads and time series cross-section analysis to estimate the technological progress of the rail industry in the U.S. and in Canada.

PERFORMING AGENCY: Data Resources Incorporated  
 INVESTIGATOR: Christensen, LR  
 SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR76-23556

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Sept. 1976 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$137,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1697)

24 152649

**IN-DEPTH CASE STUDY OF ETHICAL PROBLEMS OF PROFESSIONAL ENGINEERS-THE BART (BAY AREA RAPID TRANSIT) ENGINEERS**

This project will generate an in-depth case study of the events surrounding the dismissals of three engineers from the San Francisco Bay Area Rapid Transit District (BART), whose concern about the potential safety of the automatic train control system being designed for BART led them to actions which resulted in their dismissal. Ultimately a number of diverse organizations became involved in the case, including professional societies, a variety of regulatory committees and commissions, the state legislature and state courts. Publicity about the case has been predominantly journalistic, designed to present an advocacy point of view or to "make news." No complete scholarly study of the case has been made previously. A careful study of the many printed documents relevant to the case will be made. Interviews will be conducted with the principals of the case. The various stages of the case will be reconstructed in a step-by-step fashion. The motives, beliefs, perceptions, and behavior of the individual engineers, the BART organization, the professional and technical societies, the executive, legislative and judicial branches of government will be examined. Three types of materials will be developed: 1) a set of case study materials suitable for use in classroom situations, 2) a brief monograph for a general readership, and 3) a series of short articles for publication in scholarly and popular publications.

PERFORMING AGENCY: Purdue University, Department of Electrical Engineering

INVESTIGATOR: Anderson, RM

SPONSORING AGENCY: National Science Foundation, Office of Science and Society, OSS76-14230

STATUS: Active NOTICE DATE: Sept. 1976 START DATE: June 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$50,568

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (CE 44)

24 156651

**DEVELOPMENT OF A FREIGHT ROUTE COMPETITIVE TO CONRAIL**

An investigation of the establishment of a private rail system that would be competitive with CONRAIL in the Northeast in general and New York State in particular.

**REFERENCES:**

Challenge and Decision for New York State: The Northeast Rail Crisis, New York State Select Senate Committee on Transportation, Jan. 1974

Abandoned Railroad Rights-of-Way New York State Select Senate Committee on Transportation, Mar. 1976

PERFORMING AGENCY: New York State Legislature, Select Senate Committee on Transportation

INVESTIGATOR: Mitchell, M (Tel (518) 472-3333) Zimmerman, JF

SPONSORING AGENCY: New York State Legislature, Select Senate Committee on Transportation

RESPONSIBLE INDIVIDUAL: Mitchell, M (Tel (518) 472-3333) Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1974

ACKNOWLEDGMENT: New York State Legislature

24 157599

**POST-1990 PLANNING ISSUES FOR THE NORTHEAST CORRIDOR PROJECT**

To identify and prioritize planning issues which should be studied over the next four years to determine needs for future improvements to the Northeast Corridor Rail Passenger Service.

PERFORMING AGENCY: Transportation Research Board, Study Comm on Post-1990 Planning Issues for Northeast Corr

INVESTIGATOR: Hoel, LA

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation

RESPONSIBLE INDIVIDUAL: Ward, EJ Transportation Research Board (Tel (202)389-6337)

STATUS: Active NOTICE DATE: July 1977 START DATE: June 1977 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$50,000

290

24 157600

**MARKET STUDY FOR RAILCARS 1978 AND TO 1985**

Determine the number of cars to be produced in the U.S., Mexico and Canada in the year 1978 and with projections to 1985. A similar 1976 study will be the basis, but further definition will include market shares per carbuilder, specific car types and purchasers. Surveys will be the main source of this data. Industry and government data will be reconciled.

PERFORMING AGENCY: Planning and Forecasting Consultants

INVESTIGATOR: Steffes, DW (Tel (713)467-4732)

STATUS: Active NOTICE DATE: July 1977 START DATE: Aug. 1977 COMPLETION DATE: Dec. 1977

24 159629

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 5. RAILROAD FREIGHT CAR DISTRIBUTION**

Evaluate the current effectiveness of railroad level car distribution systems. Investigate policies currently used by railroads in inventorying cars to surplus and deficit terminals. Develop an empty car supply forecasting procedure. Design, recommend, and test an improved railroad level car distribution system.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC (Tel (202)426-2020)

Wooden, DG (Tel (202)293-5018)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$265,000

ACKNOWLEDGMENT: AAR

24 159645

**EASTERN CANADA RAIL LINE CAPACITY. PHASE I**

The first objective is to produce several 'capacity' measures for the major rail links and compare these with existing traffic densities. This may be used along with traffic forecasts to identify the more critical links. The second objective is to outline the factors which should be considered in a detailed study of any critical links. Most of the measures used will be based on an analytical model of a single track railway developed by E.R. Petersen, Queen's University, and modified by G.W. English, CIGGT.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 8.31.77

INVESTIGATOR: English, GW (Tel (613)547-5777) Schwier, C

SPONSORING AGENCY: Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: English, GW (Tel (613)547-5777)

Contract B1027

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1977 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$16,700

ACKNOWLEDGMENT: Queen's University, Canada

24 159650

**AMERICAN RAILWAY SYSTEM STUDY**

Under Section 901 of the Railroad Revitalization and Regulatory Reform Act of 1976 the following are required: (1) Survey and analysis of the physical and financial condition of the railroad industry; (2) Estimates of potential railroad rehabilitation cost savings that could result from limiting such rehabilitation to essential portions of the rail system; (3) Assessment of benefits of public ownership of rail fixed facilities; (4) Assessment of the effects of alternative rail corporate structures on the rail system; (5) Prioritized listing of rail properties which should be improved to permit high-speed rail passenger or freight service; (6) Cost-benefit evaluation of electrifying high-density rail lines; (7) Identification of rail economies that could result from improving local and terminal operations.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Economics and Operations

INVESTIGATOR: Boone, JW (Tel (202)426-9682)

SPONSORING AGENCY: Federal Railroad Administration

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1977 COMPLETION DATE: Jan. 1978

25 058293

**TRANSPORTATION INVESTMENT REQUIREMENTS AND GROWTH PATTERNS 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: Completed NOTICE DATE: Aug. 1977 START DATE: Jan. 1975 COMPLETION DATE: May 1977 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 Meador, 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: Aug. 1977 START DATE: Jan. 1974 COMPLETION DATE: Feb. 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: Doo, H (Tel (202) 426-4168)

Contract DOT-OS-50118 (CS)

STATUS: Active NOTICE DATE: Mar. 1977 START DATE: June 1975 COMPLETION DATE: Feb. 1978 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. 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 cost and service 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 phases: 1) identification of data need; 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 phases 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, Working Pap. TC 76-013, 1976

PERFORMING AGENCY: Tennessee University, Transportation Center, 142510/6297 R95

INVESTIGATOR: Patton, EP (Tel (615) 974-5311) Langley, CS, Jr

SPONSORING AGENCY: Department of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Murphy, T (Tel (202) 755-9464)

Contract DOT-OS-50125 (CS)

STATUS: Completed NOTICE DATE: Aug. 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.

## REFERENCES:

Rail Transport Research Needs Transportation Res Board Special Reports, No. 174, 1977

PERFORMING AGENCY: Transportation Research Board

SPONSORING AGENCY: Federal Railroad Administration, Department of Transportation; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Ahmed, N Way, GH

Contract DOT-OS-40022/23

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: 1977 TOTAL FUNDS: \$100,000

ACKNOWLEDGMENT: TRAIS

25 058753

#### SCENARIOS FOR ALTERNATIVE ROLES OF THE FEDERAL GOVERNMENT IN TRANSPORTATION

The research shall evaluate the economic effects of existing and prospective Federal policies governing intercity and international freight and passenger transportation enterprises in the economy of the United States. All modes of transportation shall be encompassed intermodal coordinative institutions, and Federal policies affecting domestic intercity transportation in all phases. Economic evaluation shall include the study of efficient resource allocation and distributional effects of alternative policies together with consideration of both partial and general equilibrium effects. The research shall be interdisciplinary in scope, drawing upon engineering, economic, statistics, law, and administration.

#### REFERENCES:

An Integrated Policy Model for the Surface Freight Transportation Industries, Friedlaender, AF, Center for Transportation Studies, MIT, Report No. 76-12, Sept. 1976

Econometric Estimation of Cost Functions in the Transportation Industries, Spady, R; Friedlaender, AF, Center for Transportation Studies, MIT, Report No. 76-12, Sept. 1976

Information Needs and Performance Measures Center for Transportation Studies, MIT, deNeufville, R; King, C, Report 76-15, Sept. 1976

The Rationale & Scope of Federal Transportation Policy Friedlaender, AF; Simpson, RW; Frankel, EG; deNeufville; Sloss, Center for Transportation Studies, MIT, Report No. 77-4, Mar. 1977

Hedonic Costs and Economics of Scale in the Regulated Trucking Industry, Friedlaender, AF, Center for Transportation Studies, MIT, Report No. 77-5, Jan. 1977

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies

INVESTIGATOR: Friedlaender, AF

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Nupp, BL (Tel (202) 426-4447)

Contract OS-50239 (FFP)

STATUS: Active NOTICE DATE: Mar. 1977 START DATE: Sept. 1975 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$400,000

ACKNOWLEDGMENT: TRAIS

25 059165

#### REVIEW OF 1990 PLAN DATA

The contractor shall perform the following tasks; (1) assemble, review and compare the 1990 Plan data as updated with the 1974 NTS reported data and shall conduct statistical and other analyses, as appropriate, to identify and record differences in physical state, performance and cost within States and urban areas and in the aggregate, (2) conduct analyses to determine shifts in modal emphasis; and (3) conduct analyses to determine shifts in expenditure patterns.

PERFORMING AGENCY: Peat, Marwick, Mitchell and Company

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

RESPONSIBLE INDIVIDUAL: Barbato, PJ

Contract DOT-OS-60182 (CPFF)

STATUS: Active NOTICE DATE: Mar. 1977 START DATE: May 1976 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$32,274

ACKNOWLEDGMENT: TRAIS

25 059192

#### MATHEMATICAL TECHNIQUES FOR APPLICATION TO TRANSPORTATION PLANNING

The objective is the development of a methodology for transportation planning which captures the richness of a social system interactions with any proposed change in the transportation system. The methodology to be developed is to utilize the mathematics of non-linear interaction behavior, bifurcation theory and the physical concepts of cooperative-competitive interaction phenomena.

PERFORMING AGENCY: Universite Libre de Bruxelles

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation

RESPONSIBLE INDIVIDUAL: Kahn, D (Tel (614)494-2000)

Contract DOT-TSC-1184 (FFP)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$40,000

ACKNOWLEDGMENT: TRAIS

25 059249

#### NETWORK AGGREGATION IN TRANSPORTATION PLANNING MODELS

The objectives are: (1) to initiate a coherent framework for conducting research on network aggregation methods applicable to models used in transportation planning and policy analysis; (2) to provide a preliminary test of the feasibility of using formal network aggregation rules in realistic transportation studies; (3) to continue investigation of promising lines of network aggregation research initiated in 1975; and (4) to accelerate the evolution of research results toward products deliverable to transportation analysts.

PERFORMING AGENCY: Mathematica, Incorporated

SPONSORING AGENCY: Transportation Systems Center, Department of Transportation, R6511

RESPONSIBLE INDIVIDUAL: Roberts, EJ (Tel (617) 494-2000)

Contract TSC-1232 (CPF)

STATUS: Completed NOTICE DATE: Jan. 1977 START DATE: June 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$99,420

ACKNOWLEDGMENT: TRAIS (R6511)

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 tree 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, FL., 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 intermodal 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, Leverone Hall  
 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 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 assembled, based on these analyses. Manuals on bus priority systems and transportation for the handicapped and elderly are being developed. Needs data are also being revised and updated.

REFERENCES:

- Asphalt Improvements Oct. 1976
- Institutional Framework for Integrated Transportation Planning, Oct. 1976
- Integration of Paratransit with Conventional Transit Services, Oct. 1976
- New Standard Bus Equipment Oct. 1976
- Traffic Signalization Systems Oct. 1976
- Transit Systems Productivity Mar. 1977
- Transportation for Elderly and Handicapped Persons Oct. 1978
- Transportation Planning and Impact Forecasting Tools Oct. 1976

PERFORMING AGENCY: Public Technology, Incorporated  
 INVESTIGATOR: Burke, A (Tel (202)452-7789)  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation; Federal Highway Administration, Department of Transportation; Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Linhares, AB (Tel 202-426-4208)

Contract DOT-OS-60076  
 STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$735,000

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 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.

## REFERENCES:

Freight Data Requirements for Statewide Transportation Planning. Research Report, NCHRP Rept. No. 177

Freight Data Requirements for Statewide Transportation Planning. Users Manual, NCHRP Rept. No. 178 7709

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: Completed NOTICE DATE: Aug. 1977 START DATE: July 1975 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$225,000

ACKNOWLEDGMENT: National Cooperative Highway Research Program

**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: Aug. 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: Wilkinson, W (Tel (202)426-4414)

Contract DOT-OS-60514

STATUS: Completed NOTICE DATE: Aug. 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 144359

**THE IMPACT OF REGULATION UPON TECHNICAL CHANGE IN THE RAILROAD INDUSTRY**

By examining the profitability of specific investments and innovations in Canada and the United States, the proposed research analyzes the role of the following factors upon technical change and innovation in the railroad industry: regulation, market structure, union work rules, competition, and the dispersion of economic activity. By choosing innovations in which all but one (or possibly two) of these factors are the same, and comparing the cost and demand structures associated with these innovations, it should be possible to isolate the impact of each of these factors upon technical change in the railroad industry. Innovations and investments that appear to meet these criteria include containerization, unit train, automatic coupling and braking systems, railroad operating and car management systems, centralized traffic control, automated humpyards, and investment in equipment and roadbed.

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies, 84329

INVESTIGATOR: Friedlaender, AF (Tel (617) 253-3456)

SPONSORING AGENCY: National Science Foundation, Office of Research & Development Assessment, Room P705, PRA76-17394

7617394-PRA

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Sept. 1976 COMPLETION DATE: Aug. 1978 TOTAL FUNDS: \$164,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (CD 351)

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 oversized,

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 oversized-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, Department of Transportation

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 Technology Sharing with State and Local Governments (Videotape), Diluzio, RG; Roblin, R, Feb. 1977

Management Assistance with State and Local Governments (Videotape), Diluzio, RG; Roblin, R, Feb. 1977

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: Completed NOTICE DATE: Aug. 1977 START DATE: Aug. 1976 TOTAL FUNDS: \$24,000

ACKNOWLEDGMENT: DOT

25 153574

**TRANSPORTATION SYSTEMS IN COLORADO: NEEDS ASSESSMENT AND ANALYSIS FOR COMPREHENSIVE STATE TRANSPORT**

To describe the components of the existing transportation sector in Colorado in a systematic framework. Identify goals for Colorado's transportation system and develop measures of performance on which to estimate the achievement of such goals. Identify areas of discrepancy between the existing system and the goals for the system. Develop a set of recommended actions to achieve congruence between the state goals and the transportation system.

PERFORMING AGENCY: Colorado State University, Fort Collins, Department of Economics, CSRS COL

INVESTIGATOR: Blood, D Wagner, W

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, COLO0189

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: July 1976 COMPLETION DATE: June 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070684)

25 156620

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION, STORAGE AND DISTRIBUTION SYSTEMS**

This project will evaluate the economic effects of alternative federal, state and local government policies on shippers, carriers, receivers, and rural communities. The study will: develop an inventory of existing regulation in

participating states and at the national level; Measure commodity flows into and out of case study areas in terms of commodity, origin, destination, mode, type of carriers, (regulated, exempt, and private) backhaul, service variables such as timeliness, reliability and damage incidence will be measured. Cost coefficients will be obtained and adapted to model carrier firms operating under simulated regulated and unregulated conditions as determined from survey findings. Comparison of costs and services under regulated vs. unregulated conditions will provide the basis for evaluating the merits of alternative regulatory policies. A model will be constructed which will describe rural transportation systems as they presently exist and as they would exist under alternative state and federal regulatory frameworks. The likely performance of the transportation systems will be estimated as a function of the inter-and intra-modal competitive environment.

PERFORMING AGENCY: Nebraska University, Lincoln, Department of Agricultural Economics, CSRS NEB  
SPONSORING AGENCY: Department of Agriculture, NEB-10-071

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070254)

#### 25 156676

##### RAIL BRANCH LINE SUBSIDIES AND REHABILITATION

A study of the need for rehabilitation of rail branch lines and methods of subsidizing service on lines operating in the red.

PERFORMING AGENCY: New York State Legislature, Select Senate Committee on Transportation  
INVESTIGATOR: Mitchell, M (Tel (578)472-3333) Zimmerman, JF  
SPONSORING AGENCY: New York State Legislature, Select Senate Committee on Transportation  
RESPONSIBLE INDIVIDUAL: Mitchell, M (Tel (518)472-3333) Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1973

ACKNOWLEDGMENT: New York State Legislature

#### 25 156707

##### EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS

The project will evaluate the economic effects of alternative federal, state, and local government policies on carriers, shippers, receivers, and rural communities. An inventory of existing transportation regulations and policies will be developed. Commodity flows into and out of the state will be summarized from secondary sources. Data on origin, destination, mode, back haul, seasonality and rates will be based on surveys in case study areas. The relationship between service and the competitive structure of the transportation industry will be estimated through a survey of shippers and receivers. Service variables such as timeliness, reliability, and damage incidence will be measured. The likely performance of transportation

systems will be estimated as a function of inter-and intra-modal competitive environment.

PERFORMING AGENCY: North Dakota State University, Department of Agricultural Economics, CSRS ND  
INVESTIGATOR: Cobia, DW  
SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, ND01360

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: July 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070865)

#### 25 157601

##### DEVELOPMENT OF A POLICY SENSITIVE MODEL FOR FORECASTING FREIGHT DEMAND

To investigate and evaluate the application of disaggregate freight demand models in examining transportation policy alternatives. Using a mathematical model previously specified at Massachusetts Institute of Technology to investigate the adequacy of existing freight shipment data as the basis for model calibration. To calibrate and test such a model on alternative Federal intercity freight policy alternatives and the effects on modal shares, revenues, level of service and other factors.

##### REFERENCES:

Phase I Report (Draft). Development of a Policy Sensitive Model for Forecasting Freight Demand, Roberts, B; Terzian, C, July 1977

PERFORMING AGENCY: Massachusetts Institute of Technology, DOT-OS-70006  
INVESTIGATOR: Roberts, PO (Tel (617)253-1000)  
SPONSORING AGENCY: Department of Transportation, Office of Systems Analysis and Information  
RESPONSIBLE INDIVIDUAL: Swerdloff, CN Office of the Secretary of Transportation (Tel (202)426-4163)

Contract DOT-OS-70006

STATUS: Active NOTICE DATE: July 1977 START DATE: Jan. 1977 COMPLETION DATE: July 1978 TOTAL FUNDS: \$290,000

ACKNOWLEDGMENT: OST

#### 25 159649

##### RAILROAD RATEMAKING STUDY

Under Section 202 (G) of the Railroad Revitalization and Regulatory Reform Act of 1976 the following studies are required: (1) Analysis of the effects of the regulatory reform provisions of the 4R Act on shippers and carriers in all modes; (2) Proposals for further regulatory reform.

PERFORMING AGENCY: Federal Railroad Administration  
SPONSORING AGENCY: Federal Railroad Administration

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: Oct. 1977

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.

## REFERENCES:

A Bibliography of Rail Technology Chapin, WE, FRA/ORD-77/15, May 1977, RRIS 01/157702, 7702

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)494-2457)

IA RA-75-19

STATUS: Completed NOTICE DATE: Aug. 1977 START DATE: July 1975 COMPLETION DATE: May 1977 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-FR-74193

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1977 COMPLETION DATE: Mar. 1980 TOTAL FUNDS: \$475,000

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: Aug. 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

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)

26 159646

**FURTHER DEVELOPMENT OF THE CANADIAN FREIGHT TRANSPORTATION DATA BASE**

A freight transportation data base containing marine, rail and road annual data has been developed. This project will change in the region codes of past years to correspond with the census divisions of 1976 in order to have a standard for time series usage.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 5.14.76

INVESTIGATOR: English, GW (Tel (613)547-5777) Smith, M

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

RESPONSIBLE INDIVIDUAL: English, GW (Tel (613)547-5777)

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