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50 LOCOMOTIVE DATA ACQUISITION PACKAGE. VOLUME I: SYSTEM DEVELOPMENT OVERVIEW.

51 USER'S GUIDE FOR A COMPUTERIZED TRACK MAINTENANCE SIMULATION COST METHODOLOGY.

52 ANALYSIS OF RAILROAD TRACK MAINTENANCE EXPENDITURES FOR CLASS I RAILROADS 1962-1977.

52 ANALYSIS OF THE BEHAVIORAL RELATIONSHIPS OF RAILROAD TRACK MAINTENANCE SPENDING.

53 ENGINEERING DATA CHARACTERIZING THE FLEET OF U.S. RAILWAY ROLLING STOCK. VOLUME II: METHODOLOGY AND DATA.

54 ENGINEERING DATA CHARACTERIZING THE FLEET OF U.S. RAILWAY ROLLING STOCK. VOLUME I: USER'S GUIDE.

55 CHARACTERIZING THE PERFORMANCE OF CAST-IRON HIGH-PHOSPHORUS CAST-IRON AND COMPOSITION FREIGHT CAR BRAKE SHOES UNDER SIMULATED DRAG BRAKING CONDITIONS.

55 TRUCK DESIGN OPTIMIZATION PROJECT PHASE II: WEAR DATA COLLECTION PROGRAM REPORT -- VOLUME II.

56 TRUCK DESIGN OPTIMIZATION PROJECT. PHASE II. WEAR DATA COLLECTION PROGRAM REPORT -- VOLUME I.

57 TRUCK DESIGN OPTIMIZATION PROJECT. PHASE II. TYPE II TRUCK TEST RESULTS REPORT.

58 TRUCK DESIGN OPTIMIZATION PROJECT. PHASE II: TYPE I TRUCK TEST RESULTS REPORT.

58 CURVING PERFORMANCE ANALYSIS OF FREIGHT CAR TRUCKS.

59 EVALUATION OF METHODS FOR MEASUREMENT OF LONGITUDINAL RAIL FORCE IN UNLOADED TRACK.

60 LIGHTWEIGHT VEHICLE TRACK SHUNTING.

60 CHICAGO INTERMODAL TERMINAL ROADWAY FEASIBILITY STUDY.

61 RAILROAD YARD SIMULATION MODEL: DESCRIPTION AND COMPUTER PROGRAM USERS' MANUAL.

62 ENGINEERING ANALYSIS OF STRESSES IN RAILROAD RAILS.

62 PREDICTION OF FATIGUE CRACK GROWTH IN RAIL STEELS.

63 FATIGUE CRACK GROWTH PROPERTIES OF RAIL STEELS.

64 CYCLIC INELASTIC DEFORMATION AND FATIGUE RESISTANCE OF A RAIL STEEL: EXPERIMENTAL RESULTS AND MATHEMATICAL MODELS.

64 EASTERN EUROPEAN TRACK STRUCTURE TECHNOLOGY AND RESEARCH.

65 SINGLE AXLE AND ARTICULATED-SUPPORTING TRUCK.

66 RAILROAD CLASSIFICATION YARD TECHNOLOGY MANUAL. VOLUME II: YARD COMPUTER SYSTEMS.

66 RAIL VEHICLE DYNAMICS MODEL VALIDATION.

67 TRUCK DESIGN OPTIMIZATION PROJECT (TDOP) PHASE II: PERFORMANCE SPECIFICATION FOR TYPE II FRIEGHT CAR TRUCKS.

68 PROCEEDINGS OF THE WORKSHOP (2ND) FOR RAILROAD CLASSIFICATION YARD TECHNOLOGY HELD AT ST. LOUIS MISSOURI ON MAY 6 AND 7, 1981.

68 RAILROAD CLASSIFICATION YARD TECHNOLOGY. COMPUTER SYSTEM METHODOLOGY: CASE STUCY...POTOMAC YARD.

69 FREIGHT CAR DYNAMICS.

69 FREIGHT CAR DYNAMICS: FIELD TEST RESULTS AND COMPARISON WITH THEORY.

70 INTERMODAL FREIGHT TERMINAL SIMULATOR: REQUIREMENTS DEFINITION.

71 ALTERNATE FUELS IN MEDIUM-SPEED DIESEL ENGINES: OFF-SPECIFICATION DIESEL RUELS SIMULATED COAL-DERIVED FUEL AND METHANOL.

72 DUAL DISC/TREAD BRAKING AND REDUCED PRESSURE BRAKING EVALUATION PROGRAMS.

73 RAILROAD ENERGY MANAGEMENT -- TRAIN PERFORMANCE CALCULATOR: A SURVEY AND ASSESSMENT.

73 AMTRAK FUEL CONSUMPTION STUDY.

74 BRAKE SYSTEM DESIGN OPTIMIZATION VOLUME II: SUPPLEMENTAL DATA.

75 LIGHTWEIGHT INTERMODAL FLATCAR EVALUATION RPOGRAM. VOLUME II. TEST RESULTS REPORT (INCLUDING APPENDIX A - TRANSDUCER LOCATIONS).

75 LIGHTWEIGHT INTERMODAL FLATCAR EVALUATION RPOGRAM. VOLUME I. MODAL ANALYSIS OF RAILCARS, AN EXPLANATION AND APPLICATIONS GUIDE.

76 ENERGY AUDIT OF THE BOSTON AND MAINE RAILROAD.

77 WIND TUNNEL TESTS OF TRAILER AND CONTAINER MODELS. DETERMINATION OF THE INDEPENDENT INFLUENCE OF HEIGHT AND GAP SPACINGS AND TRAILER UNDERCARRIAGE SHIELDING ON AERODYNAMIC FORCES OCCURRING DURING RAILROAD TRANSPORT.

77 CONSTANT WARNING TIME CONCEPT DEVELOPMENT FOR MOTORIST WARNING AT GRADE CROSSINGS.

78 A METALLURGICAL ANALYSIS OF AN ASTM A212-B STEEL TANK CAR HEAD PLATE.

79 RAILROAD CLASSIFICATION YARD TECHNOLOGY MANUAL. VOLUME I. YARD DESIGN METHODS.

80 RESISTANCE OF A FREIGHT TRAIN TO FORWARD MOTION. VOLUME IV. USERS' MANUAL FOR FREIGHT TRAIN FUEL CONSUMPTION PROGRAM.

80 RAILROAD ELECTROMAGNETIC COMPATIBILITY (EMC): PROCEEDINGS OF A SYMPOSIUM SPONSORED BY THE RAILROAD EMC WORKING GROUP -- ASSOCIATION OF AMERICAN RAILROADS, INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, AMERICAN RAILWAY ENGINEERING ASSOCIATION HELD AT THE UNIVERSITY OF SOUTHERN COLORADO PUEBLO ON MAY 14-15, 1980.

81 EVALUATION OF SIGNAL/CONTROL SYSTEM EQUIPMENT AND TECHNOLOGY. TASK 6: SPECIFICATION DEVELOPMENT.

81 THE NON-STEADY OUTFLOW OF PROPANE VAPOR FROM A RAILROAD TANK CAR.

82 RAILROAD CLASSIFICATION YARD TECHNOLOGY: NOISE CONTROL.

82 DUAL-MODE LOCOMOTIVE SYSTEMS ENGINEERING. VOLUME 2: DETAILED DESCRIPTION AND ANALYSIS.

83 DUAL-MODE LOCOMOTIVE SYSTEMS ENGINEERING. VOLUME 1: SUMMARY.

84 RESISTANCE OF A FREIGHT TRAIN TO FORWARD MOTION - VOLUME III. ECONOMIC ANALYSIS AND CORRELATION OF PREDICTIONS WITH FIELD DATA.

84 FUNDAMENTAL STUDIES RELATED TO WHEEL-RAIL CONTACT STRESS.

85 RAILROAD CLASSIFICATION YARD TECHNOLOGY: EVALUATION OF APPROACHES TO CAR PRESENCE DETECTION.

86 RAILROAD ELECTROMAGNETIC COMPATIBILITY: LOCOMOTIVE - VOLUME 3. SUMMARY OF AEM-7 ELECTROMAGNETIC EMISSION MEASUREMENTS.

86 REVIEW AND SUMMARY OF COMPUTER PROGRAMS FOR RAILWAY VEHICLE DYNAMICS.

87 RAILROAD CAR COUPLING SHOCK VERTICAL MOTION AND ROLLER BEARING TEMPERATURE.

87 A METALLURGICAL EVALUATION OF TWO AAR M128 STEEL TANK CAR HEAD PLATES USED IN SWITCHYARD IMPACT TESTS.

88 NONDESTRUCTIVE TECHNIQUES FOR MEASURING THE LONGITUDINAL FORCE IN RAILS PROCEEDINGS OF A JOINT GOVERNMENT-INDUSTRY CONFERENCE HELD IN WASHINGTON, D.C. ON FEBRUARY 26-27, 1979.

88 TEST TRAIN PROGRAM ELEVENTH ANNUAL REPORT.

89 LOW-PROFILE LIGHT-WEIGHT INTERMODAL RAILCAR. VOLUME II: ACCEPTANCE TEST PLAN.

90 TRUCK DESIGN OPTIMIZATION PROJECT (TDOP) PHASE II. PERFORMANCE CHARACTERIZATION OF TYPE I FREIGHT CAR TRUCKS.

91 LOW-PROFILE LIGHT-WEIGHT INTERMODAL RAILCAR. VOLUME III: REQUIREMENTS DEFINITION.

92 RAILROAD ELECTROMAGNETIC COMPATIBILITY LOCOMOTIVE. VOLUME 2, SUMMARY OF E-60 CP ROAD TEST ELECTROMAGNETIC EMISSION MEASUREMENTS.

92 RAIL PASSENGER VEHICLE TRUCK DESIGN METHODOLOGY.

93 LOW-PROFILE LIGHT-WEIGHT INTERMODAL RAILCAR. VOLUME I: PERFORMANCE SPECIFICATION.

94 RAILROAD CLASSIFICATION YARD TECHNOLOGY -- ASSESSMENT OF CAR SPEED CONTROL SYSTEMS.

95 GRADE CROSSING ACCIDENT INJURY MINIMIZATION STUDY.

95 IMPROVING RAILROAD TECHNOLOGY. A DIRECTORY OF RESEARCH AND DEVELOPMENT PROJECTS OF THE FEDERAL RAILROAD ADMINISTRATION.

96 ASSESSMENT OF LOCOMOTIVE CREW IN-CAB OCCUPATIONAL NOISE EXPOSURE.

97 PROCEEDINGS OF THE WORKSHOP FOR CLASSIFICATION YARD TECHNOLOGY HELD IN CHICAGO, ILLINOIS ON OCTOBER 30-31, 1979. A STATUS REPORT ON YARD RESEARCH.

98 G-SENSING DERAILMENT DETECTOR.

98 THERMAL SENSING UNIT TEST FOR RAILROAD CAR JOURNAL BEARINGS.

99 TRACK RENEWAL SYSTEM AND WOOD TIE REUSE ANALYSIS.

100 FRICTION SNUBBER FORCE MEASUREMENT SYSTEM COMPLETE TEST DATA.

100 FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 11 AND 12.

101 FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 9 AND 10.

102 FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 7 AND 8.

103 FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 5 AND 6.

104 FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 3 AND 4.

105 FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 1 AND 2.

106 EVALUATION OF THE COSTS AND BENEFITS OF ADVANCED BRAKING AND COUPLING SYSTEMS.

106 RAILROAD ELECTROMAGNETIC COMPATIBILITY. LOCOMOTIVE VOLUME 1, SUMMARY OF E-60 CP ELECTROMAGNETIC EMISSION YARD MEASUREMENTS.

107 OPERATIONAL PARAMETERS IN ACOUSTIC SIGNATURE INSPECTION OF RAILROAD WHEELS.

108 PERFORMANCE OF A SINGLE-SIDED LINEAR INDUCTION MOTOR WITH SOLID BACK IRON AND WITH VARIOUS MISALIGNMENTS. VOLUME 1.

109 COMPARISONS BETWEEN DESIGNS FOR SINGLE-SIDED LINEAR ELECTRIC MOTORS: HOMOPOLAR SYNCHRONOUS AND INDUCTION.

110 DESIGN FABRICATION AND EVALUATION OF PROTOTYPE WAYSIDE BRAKE INSPECTION SENSORS.

111 A REPORT ON INVESTIGATION INTO RAIL PASSENGER SAFETY.

111 PLATE INSTRUMENTED WHEELSETS FOR THE MEASUREMENT OF WHEEL/RAIL FORCES.

112 USER'S MANUAL FOR THE MAINTENANCE COST METHODOLOGY FOR HIGH SPEED PASSENGER TRAIN TRUCKS.

113 TRACK GEOMETRY MEASUREMENT SYSTEM.

113 MEASUREMENT AND DIAGNOSIS OF THE NOISE FROM A GENERAL ELECTRIC C36-7 DIESEL ELECTRIC LOCOMOTIVE.

114 AMTRAK/KNORR DISC BRAKE STUDY. VOLUME II. APPENDICES A THROUGH I.

115 AMTRAK/KNORR DISC BRAKE STUDY. VOLUME I. FINAL REPORT.

115 DEVELOPMENT OF A PROTOTYPE EMAT (ELECTROMAGNETIC ACOUSTIC TRANSDUCERS) SYSTEM FOR INSPECTION OF RAILS.

116 METROLINER TRUCK IMPROVEMENT PROGRAM.

116 TRUCK DESIGN OPTIMIZATION PROJECT (TDOP) PHASE II.

117 INTERMODAL FREIGHT PROGRAM-PHASE II DEMONSTRATION MANAGEMENT.

118 LABORATORY INVESTIGATION OF LATERAL TRACK SHIFT.

119 LABORATORY INVESTIGATION OF TRACK GAUGE WIDENING CHARACTERISTICS.

119 TRACK COMPONENT PROPERTY TESTS. VOLUME II - RAIL TIES JOINT-BARS AND FASTENERS.

120 PERSONNEL SAFETY ON ELECTRIFIED RAILROADS.

120 ANALYTICAL METHODS FOR FREIGHT CAR/TRUCK DYNAMIC PROBLEMS.

121 TRACK REHABILITATION RESEARCH AND DEVELOPMENT: A BASIS FOR PROGRAM PLANNING.

122 TRACK AND BRIDGE MAINTENANCE RESEARCH REQUIREMENTS.

122 RAILROAD R AND D CHALLENGES OF THE 80'S: OPPORTUNITIES AND OBSTACLES. RAILROAD ENGINEERING CONFERENCE PROCEEDINGS (15TH) HELD AT TRANSPORTATION SYSTEMS CENTER CAMBRIDGE, MA. ON OCTOBER 21-23, 1979.

123 MEASUREMENTS OF WHEEL/RAIL LOADS ON CLASS 5 TRACK.

124 USE OF AUTOMATICALLY ACQUIRED TRACK GEOMETRY DATA FOR MAINTENANCE-OF-WAY PLANNING.

CITATIONS

VALIDATION OF TRACK GEOMETRY INPUT TO THE VIBRATION TEST UNIT (VTU) AND ENDURANCE CAPABILITY OF THE VTU.
PB85-111995/XPS

Rajkumar, B. R. Irani, F. D.

CORP. SOURCE- Association of American Railroads, Pueblo, CO. Transportation Test Center. JOURNAL VOL.- u8502
DESCRIP. NOTE- Final rept. REPORT DATE- Jun 84
PAGINATION- 59p REPORT NO.- TCC-003(FRA-FR84) MNTR. AGNCY.- FRA/ORD 84/09 NTIS Prices- PC A04/MF A01

This report describes a series of tests conducted at the Transportation Test Center, Pueblo, Colorado, to validate two forms of track geometry inputs to the Vibration Test Unit (VTU) in the Rail Dynamics Laboratory, capable of reproducing actual revenue track conditions. The first form consisted of reformatted Plasser geometry input produced by converting the Plasser mid-chord offset data into a Space Curve format with a special software. The second track geometry input was developed based on the Locomotive Track Hazard Detector (LTHD) concept, and was produced by processing the time histories of special axle-mounted accelerometers into a space curve format. After the identification of a suitable form of input to the VTU which closely duplicated actual track conditions, a series of endurance cycle test runs was performed to demonstrate the capability of the VTU to operate for sustained periods of time using the track geometry as the input excitation.

ROLL DYNAMICS UNIT DYNAMOMETER EVALUATION TEST USING A GP40-2 LOCOMOTIVE. PB85-112001/XPS

Irani, F. Washburn, R. Peters, J. Ball, D.

CORP. SOURCE- Association of American Railroads, Pueblo, CO. Transportation Test Center. JOURNAL VOL.- u8502 DESCRIP. NOTE- Final rept. REPORT DATE- Mar 84 PAGINATION- 88p REPORT NO.- TCC-001(FRA-FR84) MNTR. AGNCY.- FRA/ORD 84/03 NTIS Prices- PC A05/MF A01

The report describes evaluative testing of the Roll Dynamics Unit (RDU) at the Transportation Test Center near Pueblo, Colorado. Previous uses of the RDU had been limited to short braking tests, truck stability tests and the transient absorption of power from a transit car. The Dynamometer tests were initiated to demonstrate the viability of the RDU as a dynamometer in testing diesel-electric locomotive tractive performance and brake system safety for extended periods.

VEHICLE/TRACK INTERACTION ASSESSMENT TECHNIQUES. VOLUME 1 PART 1. PB84-225739/XPS

Ehrenbeck, R. Polcari, S.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA. JOURNAL VOL.- u8423 DESCRIP. NOTE- Final rept. Aug 81-Jul 82 REPORT DATE- Mar 84 PAGINATION- 116p REPORT NO.- DOTTSCFRA-841.1. MNTR. AGNCY.- DOT/FRA/ORD 84/01.1 NTIS Prices- PC A06/MF A01 SUPL INFO- SEE ALSO PB84-225747. PREPARED IN COOPERATION WITH LITTLE (ARTHUR D.), INC., CAMBRIDGE, MA., BATTELLE COLUMBUS LABS., OH. AND KAMAN SCIENCES CORP., ARLINGTON, VA.

This report describes Vehicle/Track Interaction Assessment Techniques (IAT) which are developed to provide standardized procedures and tools in order to investigate the dynamic performance of railroad vehicles, and systematically identify and cure dynamic track interaction problems associated with a vehicle. The IAT addresses ten performance issues: hunting, twist and roll, pitch and bounce, yaw and sway, steady-state curving, spiral negotiation, dynamic curving, steady buff and draft, longitudinal train action, and longitudinal impact. The report discusses the test and

data analysis procedures required for each performance issue in terms of the control variables from track inputs that are required to create the test environment, the response variables to be measured, the extent of data analysis required, the data handling requirements, the performance indices to be used in interpreting the test results, and the potential test sites. This report is in two parts. Part I is contained in Volume I and covers the overall process of determining vehicle performance issues.

VEHICLE/TRACK INTERACTION ASSESSMENT TECHNIQUES. VOLUME 3 PART 2. PB84-225747/XPS

Ehrenbeck, R. Polcari, S.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA. JOURNAL VOL.- u8422 DESCRIP. NOTE- Final rept. Aug 81-Jul 82 REPORT DATE- Mar 84 PAGINATION- 519p REPORT NO.- DOTTSCFRA-8413. MNTR. AGNCY.- DOT/FRA/ORD 84/01.3 NTIS Prices- PC A22/MF A01 SUPL INFO- SEE ALSO PB84-225739. PREPARED IN COOPERATION WITH LITTLE (ARTHUR D.), INC., CAMBRIDGE, MA., BATTELLE COLUMBUS LABS., OH. AND KAMAN SCIENCES CORP., ARLINGTON, VA.

This report describes Vehicle/Track Interaction Assessment Techniques (IAT) which are developed to provide standardized procedures and tools in order to investigate the dynamic performance of railroad vehicles, and systematically identify and cure dynamic track interaction problems associated with a vehicle. Part II discusses the detailed procedures to be used in the Vehicle/Track Interaction Assessment Techniques.

ALTERNATIVE FUELS IN MEDIUM-SPEED DIESEL ENGINES. VOLUME II. SYNTHETIC FUELS ALCOHOL EMULSIONS OFF-SPECIFICATION FUELS AND METHANOL. DE83000013/XPS

Baker, Q. A. Ariga, S. Alpert, A. M.

CORP. SOURCE- Southwest Research Inst., San Antonio, TX.
JOURNAL VOL.- u8420 n0800 REPORT DATE- Oct 81
PAGINATION- 174p REPORT NO.- DOECS54266-2 CONT. NO.- AC01-78CS54266 NTIS Prices- PC A08/MF A01 SUPL INFO- PORTIONS OF DOCUMENT ARE ILLEGIBLE.

This report describes the second year of research activity of an ongoing research, development and demonstration effort to investigate the use of alternative fuels in medium-speed diesel engines. The first year of the project (Phase I) is the subject of an earlier report available through NTIS. Tests were performed in laboratory medium-speed diesel engines to define the ability of these engines to operate on alternative fuels, the fuel property limits that the engines can tolerate, and the problems associated with alternative fuels use. Low cetane number and high viscosity petroleum fuels were tested to define the tolerance limits of these properties. Attempts were made to improve low cetane number fuel performance through minor engine modifications and adjustments. Also tested were alcohol-in-diesel fuel emulsions, synthetic fuels, and low proof ethanol. Both methanol and ethanol were consumed in stabilized and unstabilized emulsion forms. The synthetic fuels included a PARAHO shale oil marine diesel fuel, and solvent refined coal (SRC II) liquid fuel. The engines were capable of operating on all of these fuels, demonstrating their versatility. In the case of poor ignition quality fuels, dual-fueling provided a suitable ignition source. Performance and combustion characteristics were frequently equal to normal diesel fuel levels. (ERA citation 08:005592)

PASSENGER TRAIN EQUIPMENT REVIEW REPORT. VOLUME 5. BANKING SYSTEMS AND TRAIN ARTICULATION. PB84-174226/XPS

CORP. SOURCE- Unified Industries, Inc., Springfield, VA. JOURNAL VOL.- u8414 DESCRIP. NOTE- Final rept. Feb-May 81. REPORT DATE- May 81 PAGINATION- 133p CONT. NO.- DTFR53-81-P-00189 MNTR. AGNCY.- FRA/ORD 81/45.5 NTIS Prices- PC A07/MF A01 SUPL INFO- SEE ALSO VOLUME 4, PB84-161686. PREPARED IN COOPERATION WITH BATTELLE COLUMBUS LABS., OH., CARNEGIE-MELLON UNIV., PITTSBURGH, PA. TRANSPORTATION RESEARCH INST., AND MARCHETTI (J. W.), INC., NATICK, MA.

Early in 1977, the Federal Railroad Administration, Office of Research and Development, initiated the Improved Passenger Equipment Evaluation Program (IPEEP), which was designed as a detailed systematic review of advanced passenger trains and equipment throughout the world that could possibly be used in the United States. During the course of this program, the members of the IPEEP Train System Review Team prepared 24 technical papers, in addition to the basic set of IPEEP reports covering baseline data and individual train reviews and a separate report on train performance methodology. This volume of three papers covers clearances for tilt-body passenger vehicles in the Northeast Corridor, tilt systems of modern passenger vehicles, and British and French passenger vehicle articulation systems.

PASSENGER TRAIN EQUIPMENT REVIEW REPORT. VOLUME 1. ADVANCED PROPULSION SYSTEMS AND PROPULSION SYSTEM REQUIREMENTS. PB84-178375/XPS

CORP. SOURCE- Unified Industries, Inc., Springfield, VA. JOURNAL VOL.- u8414 DESCRIP. NOTE- Final rept. Feb-May 81 REPORT DATE- May 81 PAGINATION- 210p CONT. NO.- DTFR53-81-P-00189 MNTR. AGNCY.- FRA/ORD 81/45.1 NTIS Prices- PC A10/MF A01 SUPL INFO- SEE ALSO VOLUME 2, PB84-178383, AND VOLUME 4, PB84-161686. PREPARED IN COOPERATION WITH BATTELLE COLUMBUS LABS., OH., CARNEGIE-MELLON UNIV., PITTSBURGH, PA. TRANSPORTATION RESEARCH INST., AND MARCHETTI (J. W.), INC., NATICK, MA.

Early in 1977, the Federal Railroad Administration, Office of Research and Development, initiated the Improved Passenger Equipment Evaluation Program (IPEEP), which was

designed as a detailed systematic review of advanced passenger trains and equipment throughout the world that could possibly be used in the United States. During the course of this program, the members of the IPEEP Train System Review Team prepared 24 technical papers, in addition to the basic set of IPEEP reports covering baseline data and individual train reviews and a separate report on train performance methodology. This volume contains one paper giving a review of advanced passenger train propulsion systems and one paper identifying the requirements for passenger train propulsion systems.

PASSENGER TRAIN EQUIPMENT REVIEW REPORT. VOLUME 2. PROPULSION SYSTEM COMPONENTS AND FUTURE TRAIN ENERGY CONSUMPTION. PB84-178383/XPS

CORP. SOURCE- Unified Industries, Inc., Springfield, VA. JOURNAL VOL.- u8414 DESCRIP. NOTE- Final rept. Feb-May 81 REPORT DATE- May 81 PAGINATION- 304p CONT. NO.- DTFR53-81-P-00189 MNTR. AGNCY.- FRA/ORD 81/45.2 NTIS Prices- PC A14/MF A01 SUPL INFO- SEE ALSO VOLUME 1, PB84-178375, AND VOLUME 3, PB84-178391. PREPARED IN COOPERATION WITH BATTELLE COLUMBUS LABS., OH., CARNEGIE-MELLON UNIV., PITTSBURGH, PA. TRANSPORTATION RESEARCH INST., AND MARCHETTI (J. W.), INC., NATICK, MA.

Early in 1977, the Federal Railroad Administration, Office of Research and Development, initiated the Improved Passenger Equipment Evaluation Program (IPEEP), which was designed as a detailed systematic review of advanced passenger trains and equipment throughout the world that could possibly be used in the United States. During the course of this program, the members of the IPEEP Train System Review Team prepared 24 technical papers, in addition to the basic set of IPEEP reports covering baseline data and individual train reviews and a separate report on train performance methodology. This volume of six papers covers traction motor drives, modern slip detection and control systems for electric locomotives and multiple-unit cars, onboard high-voltage switchgear for electric locomotives and multiple-unit cars, high-voltage protection and switching control for Northeast Corridor vehicles, pantographs, and the energy consumption of future passenger trains.

PASSENGER TRAIN EQUIPMENT REVIEW REPORT. VOLUME 3. SUSPENSION AND GUIDANCE SYSTEMS. PB84-178391/XPS

CORP. SOURCE- Unified Industries, Inc., Springfield, VA. JOURNAL VOL.- u8414 DESCRIP. NOTE- Final rept. Feb-May 81. REPORT DATE- May 81 PAGINATION- 236p CONT. NO.- DTFRS53-81-P-00189 MNTR. AGNCY.- FRA/ORD 81/45.3 NTIS Prices- PC A11/MF A01 SUPL INFO- SEE ALSO VOLUME 2, PB84-178383, AND VOLUME 4, PB84-161686. PREPARED IN COOPERATION WITH BATTELLE COLUMBUS LABS., OH., CARNEGIE-MELLON UNIV., PITTSBURGH, PA. TRANSPORTATION RESEARCH INST., AND MARCHETTI (J. W.), INC., NATICK, MA.

Early in 1977, the Federal Railroad Administration, Office of Research and Development, initiated the Improved Passenger Equipment Evaluation Program (IPEEP), which was designed as a detailed systematic review of advanced passenger trains and equipment throughout the world that could possibly be used in the United States. During the course of this program, the members of the IPEEP Train System Review Team prepared 24 technical papers, in addition to the basic set of IPEEP reports covering baseline data and individual train reviews and a separate report on train performance methodology. This volume of eight papers covers passenger vehicle axle loads, criteria for high-speed curving of passenger vehicles, radial steering systems for high-speed passenger trains, comparison of conventional and radial trucks, wheel profiles for high speed passenger trains, sensitivity of wheel size to induction and synchronous traction motor drives, influence of unsprung mass on rail vehicle/track performance, and use of instrumented wheelsets to measure wheel/rail forces.

PASSENGER TRAIN EQUIPMENT REVIEW REPORT. VOLUME 6. CAR BODY CONSTRUCTION AND CRASHWORTHINESS. PB84-180884/XPS

CORP. SOURCE- Unified Industries, Inc., Springfield, VA. JOURNAL VOL.- u8414 DESCRIP. NOTE- Final rept. Feb-May 81. REPORT DATE- May 81 PAGINATION- 69p CONT. NO.- DTFR53-81-P-00189 MNTR. AGNCY.- FRA/ORD 81/45.6 NTIS Prices- PC A04/MF A01 SUPL INFO- PREPARED IN COOPERATION WITH BATTELLE COLUMBUS LABS., OH. AND CARNEGIE-MELLON UNIV., PITTSBURGH, PA. SEE ALSO VOLUME 4, PB84-161686.

Early in 1977, the Federal Railroad Administration, Office of Research and Development, initiated the Improved Passenger Equipment Evaluation Program (IPEEP), which was designed as a detailed systematic review of advanced passenger trains and equipment throughout the world that could possibly be used in the United States. During the course of this program, the members of the IPEEP Train System Review Team prepared 24 technical papers. This volume contains one paper on intercity passenger car body structural technology and one paper on the influence of construction materials on the crashworthiness of passenger car bodies.

PASSENGER TRAIN EQUIPMENT REVIEW REPORT. VOLUME 4. BRAKING SYSTEMS. PB84-161686/XPS

CORP. SOURCE- Unified Industries, Inc., Springfield, VA. JOURNAL VOL.- u8413 DESCRIP. NOTE- Final rept. Feb-May 81. REPORT DATE- May 81 PAGINATION- 164p CONT. NO.- DTFR53-81-P-00189 MNTR. AGNCY.- FRA/ORD 81/45.4 NTIS Prices- PC A08/MF A01

Early in 1977, the Federal Railroad Administration, Office of Research and Development, initiated the Improved Passenger Equipment Evaluation Program (IPEEP), which was designed as a detailed systematic review of advanced passenger trains and equipment throughout the world that could possibly be used in the United States. During the course of this program, the members of the IPEEP Train System Review Team prepared 24 technical papers, in addition to the basic set of IPEEP reports covering baseline data and individual train reviews and a separate report on train performance methodology. This volume of three papers covers minimum braking rate and worst-case braking distance

characteristics for advanced U.S. high-speed passenger trains; braking systems for advanced high-speed passenger trains in France, Britain, Canada, and the United States; and the effect of articulation on passenger train braking systems.

ALTERNATIVE FUELS FOR MEDIUM-SPEED DIESEL ENGINES (AFFMSED) PROJECT: SLURRIES EMULSIONS AND BLENDED-FUEL EXTENDERS; CYLINDER WEAR MEASUREMENTS STAGED INJECTION. THIRD RESEARCH PHASE FINAL REPORT. DE84000524/XPS

Baker, Q. A. Jr.

CORP. SOURCE- Southwest Research Inst., San Antonio, TX.
JOURNAL VOL.- u8405 n0800 REPORT DATE- Aug 83
PAGINATION- 186p REPORT NO.- DOECS54266-3, SWRI-5361-003
CONT. NO.- AC01-78CS54266 AVAIL. NOTE- Portions are illegible in microfiche products. NTIS Prices- PC A09/MF A01

The third year of research activity on an ongoing research, development and demonstration effort to investigate the use of alternative fuels for medium-speed engines is described. Tests were performed using laboratory medium-speed diesel engines to define the ability of these engines to operate on alternative fuels, the fuel property limits that the engines can tolerate, the problems associated with alternative fuels use, and methods to improve fuel tolerance and to overcome the problems identified. The fuels studied during the Phase III program were alcohol-in-diesel fuel emulsions, water-in-diesel fuel emulsions, sunflower oil/diesel fuel blends, No. 6 fuel oil/diesel fuel blends, and a carbon black/diesel fuel slurry. Also studied were methods to measure cylinder liner and piston ring wear rates in a short period of engine operation. Finally, staged injection was investigated as a means to improve engine performance on low cetane number fuels. (ERA citation 08:055935)

ANALYSIS OF LATERAL RAIL RESTRAINT. PB84-123132/XPS

Jeong, D. Coltman, M.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA.
JOURNAL VOL.- u8404 DESCRIP. NOTE- Final rept. Jun-Sep 80
REPORT DATE- Sep 83 PAGINATION- 88p REPORT NO.-
DOT-TSC-FRA-83-4 MNTR. AGNCY.- FRA/ORD 83/15 NTIS
Prices- PC A05/MF A01

This report deals with the analysis of lateral rail strength using the results of experimental investigations and a nonlinear rail response model. Part of the analysis involves the parametric study of the influence of track parameters on lateral rail restraint. These parameters include rail size, rail support characteristics, and wheel versus truck loading. Based on these results, safety limits on allowable rail restraint degradation for low speed track are presented.

ANALYTIC STUDIES OF THE RELATIONSHIP BETWEEN TRACK GEOMETRY VARIATIONS AND DERAILMENT POTENTIAL AT LOW SPEEDS. PB84-129329/XPS

Blader, F. B.

CORP. SOURCE- Analytical Sciences Corp., Reading, MA.
JOURNAL VOL.- u8404 DESCRIP. NOTE- Final rept. Oct 81 Mar 83 REPORT DATE- Sep 83 PAGINATION- 134p CONT. NO.-
DTRJ57-80-C-00062 MNTR. AGNCY.- FRA/ORD 83/16,
DOT-TSC-FRA 83-3 NTIS Prices- PC A07/MF A01

This report describes analytical studies carried out to define the relationship between track parameters and safety from derailment. Problematic track scenarios are identified reflecting known accident data. Vehicle response is investigated in the 10-25 mph speed range, using an analytic model of a freight vehicle to identify critical values of body roll, and incipient wheel drop and rail climb, on track with weak lateral restraint. The track model includes gauge variation as well as alignment and cross-level in curves and the vehicle represents a 100-ton hopper car. Model results compare well with experimental results. Safe values for gauge and crosslevel are identified for curved track containing lateral cusps at outer rail joints with and

without cross-level cusps at staggered joints. Safe values of alignment are identified for sinusoidal alignment variation with constant gauge on tangent track and in curves up to 10 degrees. Recommendations are made on improvements to the computational efficiency and accuracy of the simulation and on further efforts required to identify completely safe values for track over the range of speeds, vehicle types and track conditions encountered in service.

RAIL WEAR ECONOMIC ANALYSIS FOR TYPE 2 TRUCKS.
PB84-108448/XPS

McIlveen, E. R. Schwier, C. Glaser, R. Birk, A. M. Lake, R. W.

CORP. SOURCE- Canadian Inst. of Guided Ground Transport, Kingston (Ontario). JOURNAL VOL.- u8402 DESCRIP. NOTE- Final rept. REPORT DATE- 1982 (C) PAGINATION- 310p REPORT NO.- CIGGT-82-3 MNTR. AGNCY.- FRA/ORD 82/49, TDC/TP 3863E NTIS Prices- PC A14 SUPL INFO- PORTIONS OF THIS DOCUMENT ARE NOT FULLY LEGIBLE.

Recent introduction of a number of new freight car truck designs has prompted the railroad industry to reexamine the standard three-piece freight car truck. The U.S. Federal Railroad Administration (FRA) responded to this interest by launching the Truck Design Optimization Project (TDOP), with the Southern Pacific Railroad (SP) as the prime contractor during the first phase, and then with Wyle Laboratories of Colorado Springs (teamed with the Union Pacific Railroad) as the second-phase prime contractor. The conclusions from these studies were that indeed there are roles for an improved truck design -- particularly for high-mileage, dedicated-service cars, e.g. unit coal trains or intermodal service. This conclusion was largely based on the economics of improved rail wear, though savings in car maintenance, fuel consumption, lading damage, and derailments were also considered.

NORTHEAST CORRIDOR SPEED PROFILE SIMULATOR: LOCOMOTIVE PERFORMANCE IN TERMS OF REAL SPEED PROFILES.
PB83-255190/XPS

Stewart, B. J. Conner, J. P. II.

CORP. SOURCE- ENSCO, Inc., Springfield, VA. JOURNAL VOL.- u8326 DESCRIP. NOTE- Final rept. REPORT DATE- Feb 83 PAGINATION- 76p REPORT NO.- ENSCO-DOT-FRA-83-04 CONT. NO.- DTFR53-80-C-00002 MNTR. AGNCY.- DOT/FRA/ORD 82-52 NTIS Prices- PC A05/MF A01

A microprocessor device to display speed profile information to a locomotive engineer is described. This system was deployed at the Transportation Test Center to provide speed profile information to simulate Northeast Corridor operations.

BALLAST AND SUBGRADE REQUIREMENTS STUDY: SUMMARY AND ASSESSMENT REPORT. PB83-262493/XPS

Simon, R. M. DiPilato, M. A.

CORP. SOURCE- Goldberg-Zoino and Associates, Inc., Newton Upper Falls, MA. JOURNAL VOL.- u8326 DESCRIP. NOTE- Final rept. Jul 78-Jan 81 REPORT DATE- Jun 83 PAGINATION- 85p CONT. NO.- DOT-TSC-1527 MNTR. AGNCY.- FRA/ORD 83/04.3, DOT-TSC-FRA 82-5 AVAIL. NOTE- Also available in set of 3 reports PC E99, PB83-262485. NTIS Prices- PC A05/MF A01

Earth materials - i.e. soil and rock - form the substructure of all railroad track. In this report a summary and assessment is presented with respect to current and available practices for substructure (ballast, subballast, and subgrade) materials evaluation and selection, stabilization, design and analysis, and performance evaluation.

BALLAST AND SUBGRADE REQUIREMENTS STUDY: RAILROAD TRACK SUBSTRUCTURE - DESIGN AND PERFORMANCE PRACTICES. PB83-262501/XPS

DiPilato, M. A. Steinberg, E. I. Simon, R. M.

CORP. SOURCE- Goldberg-Zoino and Associates, Inc., Newton Upper Falls, MA. JOURNAL VOL.- u8326 DESCRIP. NOTE- Final rept. Jul 78-Jan 81 REPORT DATE- Jun 83 PAGINATION- 178p CONT. NO.- DOT-TSC-1527 MNTR. AGNCY.- FRA/ORD 83/04.2, DOT-TSC-FRA 82-4 AVAIL. NOTE- Also available in set of 3 reports PC E99, PB83-262485. NTIS Prices- PC A09/MF A01

Earth materials - i.e., soil and rock - form the substructure (ballast, subballast, and subgrade) of all railroad track. In this report, the most suitable technology and design criteria as related to design of the substructure are identified based on a review of current track substructure design procedures employed in the United States and foreign countries. A primary emphasis has been placed on identifying an approach for rational design of track to support vertical, lateral, and longitudinal loads. Principal design parameters and available analytic and empirical design procedures are discussed.

BALLAST AND SUBGRADE REQUIREMENTS STUDY: RAILROAD TRACK SUBSTRUCTURE - MATERIALS EVALUATION AND STABILIZATION PRACTICES. PB83-262519/XPS

Simon, R. M. Edgers, L. Errico, J. V.

CORP. SOURCE- Goldberg-Zoino and Associates, Inc., Newton Upper Falls, MA. JOURNAL VOL.- u8326 DESCRIP. NOTE- Final Rept. Jul 78-Jan 81 REPORT DATE- Jun 83 PAGINATION- 386p CONT. NO.- DOT-TSC-1527 MNTR. AGNCY.- FRA/ORD 83/04.1, DOT-TSC-FRA 82-3 AVAIL. NOTE- Also available in set of 3 reports PC E99, PB83-262485. NTIS Prices- PC A17/MF A01

Earth materials--i.e., soil and rock--form the substructure of all railroad track. In this report, the functions and performance characteristics of each of the substructure elements (i.e., ballast, subballast, and subgrade), and the material properties that influence the substructure

performance are described. In addition, guidelines are provided for their use in railroad track.

LOCOMOTIVE DATA ACQUISITION PACKAGE. VOLUME 5. LOCOMOTIVE ANALYSIS SOFTWARE PACKAGE: USER'S GUIDE. PB83-221804/XPS

Hamid, A. Storch, P. Scofield, R. Davis, M.

CORP. SOURCE- ENSCO, Inc., Springfield, VA. JOURNAL VOL.- u8321 h8301 DESCRIP. NOTE- Final rept. Apr 81-Jan 82 REPORT DATE- Mar 82 PAGINATION- 223p REPORT NO.- 1444-211 CONT. NO.- DTFR53-80-C-00002 MNTR. AGNCY.- FRA/DF 83/001A, DOT/FRA/ORD 82.09.V NTIS Prices- PC A10/MF A01

The Locomotive Data Acquisition Package (LDAP) is a complete data acquisition system designed specifically for use on board railroad locomotives to study locomotive performance while in normal over-the-road operations. It is a semi-portable system requiring only limited installation support commonly found in railroad shops. The system may be applied to study energy conservation measures as well as train dynamics. This volume describes a Locomotive Analysis Software Package consisting of 12 software programs which may be used for data verification, data reduction, and analysis of data collected by the Locomotive Data Acquisition Package. Baseline data is provided to illustrate the use of the analytical software which has been developed. While the programming has been developed for use on a DEC PDP-11 computer the language and format is suited to use on other computer systems.

LASP: LOCOMOTIVE ANALYSIS SOFTWARE PACKAGE. PB83-221812

Bang, A.

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8321 h8301 DESCRIP. NOTE- Software REPORT DATE- Mar 82 PAGINATION- mag tape REPORT NO.- DOTFRAORD-82.09.V-1 MNTR. AGNCY.- FRA/DF 83/001 AVAIL. NOTE- Source tape is in ASCII character set. Character set restricts preparation to 9 track, one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products if you have questions. Price includes documentation, PB83-221804. NTIS Prices- CP T03

The tape contains Locomotive Analysis Software Package for analyzing the data collected by a Locomotive Data Acquisition Package (LDAP). The LDAP is designed to study the locomotive performance and may be applied to study the energy conservation measures as well as train dynamics. The locomotive analysis software package consists of 12 computer programs which, along with the subroutines, reside on 31 files on the tape. These programs may be used for data verification, data reduction and analysis of data collected by LDAP. While the programs have been developed for use on a DEC PDP 11/70 computer, the language and format is suitable for use on other computer systems...Software Description: The system is written in the FORTRAN programming language for implementation on a DEC PDP 11/70 computer using the IAS version 3.1 operating system. The computer memory requirement is 64K.

DEMONSTRATION OF THE BUDD COMPANY AMCOACH TILT BODY SYSTEM. PB83-226423/XPS

Dean, W. C. Herring, J. M. Jr.

CORP. SOURCE- Budd Co., Fort Washington, PA. Technical Center. JOURNAL VOL.- u8320 DESCRIP. NOTE- Final rept. REPORT DATE- Apr 83 PAGINATION- 96p REPORT NO.- TCR-0595 CONT. NO.- DTFR53-80-C-00111 MNTR. AGNCY.- FRA/ORD 83/01 NTIS Prices- PC A05/MF A01

The objective of this program was to demonstrate the Tilt System developed by The Budd Company. This system is

applicable to any corridor and it will provide the most cost effective method of reducing trip times on the Northeast Corridor by allowing higher travel speeds on existing curves while maintaining the same level of passenger comfort. The Tilt System can be retrofit on the existing Amfleet cars with minimum modifications. The system is powered pneumatically. The controller is an on-off type. It is fail safe - in the event of a power failure, the system will return to the neutral position. This system allows increases in curving speeds of between 20% and 35% depending on superelevation as compared to conventional cars.

PARAMETRIC STUDIES ON LATERAL STABILITY OF WELDED RAIL TRACK. PB83-215517/XPS

Samavedam, G. Kish, A. Jeong, D.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA. JOURNAL VOL.- u8319 DESCRIP. NOTE- Interim rept. Nov 81-Aug 82 REPORT DATE- May 83 PAGINATION- 59p REPORT NO.- DOTTSCFRA-83-1 CONT. NO.- DOT-RR-219 MNTR. AGNCY.- DOT/FRA/ORD 83/07 NTIS Prices- PC A04/MF A01

Thermal buckling of railroad tracks in the lateral plane is an important problem in the design and maintenance of continuous welded rails (CWR). The severity of the problem is manifested through the increasing number of derailments which are attributable to track buckling, indicating a need for developing better control on the allowable safe temperature increase for CWR track. The work reported here is part of a major investigation conducted on the analytical predictions of critical buckling loads and temperatures, and deals with a parametric investigation of the buckling response of CWR track.

DETERMINATION OF RESIDUAL STRESSES IN RAILS.
PB83-215541/XPS

Groom, J. J.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8319 DESCRIP. NOTE- Final rept. REPORT DATE- May 83 PAGINATION- 74p CONT. NO.- DOT-TSC-1426 MNTR. AGNCY.- DOT/FRA/ORD 83/05, DOT-TSC-FRA 81-21 NTIS Prices- PC A04/MF A01

A destructive sectioning technique for measuring the complete three-dimensional residual stresses in a rail cross section was developed. The technique was applied to four tangent rail specimens: two 136-pound specimens were taken from FAST (Facility for Accelerated Service Testing), Pueblo, CO (83 and 270 MGT (million gross tons)) and two 132-pound specimens were obtained from revenue service (100 and 300 MGT).

ANALYSIS OF THERMAL BUCKLING TESTS ON U.S. RAILROADS.
PB83-203554/XPS

Kish, A. Samavedam, G. Jeong, D.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA. JOURNAL VOL.- u8317 DESCRIP. NOTE- Interim rept. Jun 81-Dec 81 REPORT DATE- Nov 82 PAGINATION- 102p REPORT NO.- DOT-TSC-FRA-82-6 MNTR. AGNCY.- FRA/ORD 82/45 NTIS Prices- PC A06/MF A01

Thermal buckling of railroad tracks in the lateral plane is an important problem in the design and maintenance of continuous welded rails (CWR). The severity of the problem is manifested through the increasing number of derailments which are attributable to track buckling, indicating a need for developing better control on the allowable, safe temperature increase for CWR track. The experimental work consisted of two major tests at The Plains, VA, conducted as part of a cooperative research program with the Southern Railway System. One test was on tangent track and the other on curved. Both test zones were fully instrumented for compressive forces, temperatures, lateral and longitudinal displacements. Analyses of the two test results, theoretical predictions and conclusions of practical significance are

presented.

RESULTS OF ANALYSIS OF 70 TON BOXCAR VIBRATION TESTS
PB83-197723/XPS

Kachadourian, G.

CORP. SOURCE- MITRE Corp., McLean, VA. METREK Div.
JOURNAL VOL.- u8316 REPORT DATE- Mar 83 PAGINATION-
68p REPORT NO.- MTR-82W00104 CONT. NO.-
DTFR53-82-C-0087 MNTR. AGNCY.- DOT/FRA/ORD 83/06 NTIS
Prices- PC A04/MF A01

This is the second of three volumes covering tests performed in April and May of 1981 at the Transportation Test Center (TTC) in Pueblo, Colorado on a 70 ton boxcar with Barber S-2-C trucks. The objective of the testing was to define the dynamic properties of the freight car for use in validating a mathematical model. The testing was conducted in two phases: (1) static tests were performed on each truck to characterize its stiffness and damping properties; (2) vibration tests were performed on the complete boxcar, loaded and empty, to determine resonant frequencies. Final results of Phase I have been documented in FRA/ORD-82/23 'Summary Results of 70 Ton Boxcar Testing', prepared by MITRE in April 1982. Results of the Phase II testing are covered in this report. This report defines the roll, bounce, pitch and yaw vibration characteristics of the boxcar; it also defines the carbody torsion and bending frequencies and resonant frequencies of the lading and presents comparisons between test results and the boxcar model to be validated.

PERTURBED TRACK TEST: RESULTS OF DATA ANALYSIS.
PB83-191551/XPS

Boghani, A. B. Palmer, D. W. Nayak, P. R.

CORP. SOURCE- Little (Arthur D.), Inc., Cambridge, MA.
JOURNAL VOL.- u8315 DESCRIP. NOTE- Final rept. REPORT DATE- Feb 83 PAGINATION- 221p REPORT NO.- ADL-C-85102
CONT. NO.- DTRS57-80-C-00111 MNTR. AGNCY.- DOT/FRA/ORD 83/08 NTIS Prices- PC A10/MF A01

The Perturbed Track Test (PTT) involving the E-8 and SDP-40F locomotives was conducted at the Transportation Test Center (TTC) during November and December, 1978. Two of the primary objectives of the PTT were to gain further understanding of track/vehicle interaction; and to demonstrate and evaluate the use of controlled perturbed track to assess vehicle dynamic performance, thus assisting in the design of SAFE (Stability Assessment Facility for Equipment).

HANDBOOK FOR THE MEASUREMENT ANALYSIS AND ABATEMENT OF RAILROAD NOISE. PB83-166173/XPS

Stusnick, E. Montroll, M. L. Plotkin, K. J. Kohli, V. K.

CORP. SOURCE- Wyle Labs./Wyle Research, Arlington, VA.
JOURNAL VOL.- u8313 DESCRIP. NOTE- Final rept. Sep 79-Dec 81 REPORT DATE- Jan 82 PAGINATION- 285p REPORT NO.- WR-81-10 CONT. NO.- DOT-TSC-1786 MNTR. AGNCY.- DOT/FRA/ORD 82/02-H NTIS Prices- PC A13/MF A01

This handbook gathers together in one place the necessary background material, the required measurement and analysis procedures, and the currently available abatement techniques to respond to and meet current railroad noise regulations. The first chapter of the handbook briefly describes its development, arrangement, and suggested use. The second chapter provides an introduction to the field of acoustics. Numerous examples are provided to clarify the concepts which are developed. The remaining three chapters of the handbook describe the existing railroad noise regulations themselves. For each regulated noise source, the following items are provided: a summary of the pertinent regulation; a description of the acoustic metric; a description of the

required measurement site conditions; a listing of the necessary instrumentation; a description of measurement procedures; a summary of the existing data base describing noise from the source; and suggestions on possible techniques of controlling noise emission from the source. Where appropriate, sample worksheets and data sheets are provided.

FATIGUE CRACK INITIATION PROPERTIES OF RAIL STEELS.
PB83-162297/XPS

Rice, R. C. Broek, D.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8312 DESCRIP. NOTE- Final Rept. REPORT DATE- Mar 82 PAGINATION- 65p CONT. NO.- DOT-TSC-1426 MNTR. AGNCY.- DOT-TSC-FRA 81-22, FRA/ORD 82-05 NTIS Prices- PC A04/MF A01

Fatigue crack initiation properties of rail steels were determined experimentally. One new and four used rail steels were investigated. The effects of the following parameters were studied: stress ratio (ratio of minimum to maximum stress in a cycle), control mode, specimen orientation, and periodic overstrain. Both constant and variable strain amplitude experiments were performed. A model was developed, employing an equivalent strain parameter, which allowed prediction of variable amplitude fatigue crack initiation within the basic data variability.

INVESTIGATION OF RAIL FASTENER PERFORMANCE REQUIREMENTS.
PB83-161703/XPS

Dean, F. E.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8312 DESCRIP. NOTE- Interim rept. Oct 80-Jun 81 REPORT DATE- Mar 82 PAGINATION- 79p CONT. NO.- DOT-FR-9162 MNTR. AGNCY.- DOT/FRA/ORD 82/10 NTIS Prices- PC A05/MF A01

An investigation was conducted to develop qualification requirements which reliably duplicate the service

performance of rail fasteners. The study included a review of available data from qualification tests, measurements of rail/tie deflections and fastener clip strains at the Facility for Accelerated Service Testing (FAST), and laboratory tests at Battelle which simulated the FAST environment. Several aspects of service performance at FAST were successfully duplicated in the laboratory tests. Recommendations are made for the design of improved fastener qualification tests.

LOCOMOTIVE DATA ACQUISITION PACKAGE. VOLUME IV. INSTRUMENTED COUPLER PIN DEVELOPMENT. PB83-158618/XPS

Gunn, J. Resnick, L. Lauritzen, T. Scalise, D. T.

CORP. SOURCE- California Univ., Berkeley. Lawrence Berkeley Lab. JOURNAL VOL.- u8312 DESCRIP. NOTE- Final rept. Mar 80-Dec 81 REPORT DATE- Mar 82 PAGINATION- 30p REPORT NO.- ATT-989 CONT. NO.- DTFR53-80-X-00073, CONT. NO.- W-7405-eng-48 MNTR. AGNCY.- DOT/FRA/ORD 82/09.IV NTIS Prices- PC A03/MF A01

A new method has been developed for measuring the drawbar dynamic forces exerted by a railroad locomotive while pulling its payload. Such dynamic data are necessary to determine the effect of train-handling on locomotive performance, train structural stresses, and safety. Previous methods for measuring the drawbar forces modified the bulky locomotive coupler for use as the force-sensor. This resulted in expensive devices which were difficult to transport because of their bulk and which had strain-gage exposures vulnerable to damage in the severe environment of railroad operations. The new method uses a specially-designed coupler pin as the force-sensor. In this special pin, the shear-forces (imposed by the locomotive drawbar) are first transformed into bending stresses and then measured by strain-gages located inside small longitudinal holes in the shear pin. This results in important advantages over the previous methods; the new sensor is much less expensive, more easily portable (35 vs. 400 pounds) and more reliable and less susceptible to damage.

ANALYSIS OF LOCOMOTIVE CABS. PB83-150631/XPS

CORP. SOURCE- National Space Technology Labs., NSTL Station, MS. JOURNAL VOL.- u8311 DESCRIP. NOTE- Final rept. Oct 79-Sep 82. REPORT DATE- Sep 82 PAGINATION- 170p MNTR. AGNCY.- DOT/FRA/ORD 81/84 NTIS Prices- PC A08/MF A01

This report covers research that was performed to investigate the present crashworthiness state of in-service locomotives and design applications for new locomotives to protect occupants from serious or fatal injury during collision conditions. The tasks that were performed are: (1) identify past and present accident histories of railroads covering all types of accidents, especially rear-end and head-on collisions resulting in car override; (2) analyze concepts that are currently available for mitigating the car override problem and identify improved concepts; (3) analyze the impact of these concepts on railroad operations considering both implementation and cost; (4) develop performance guidelines for the most beneficial concepts to be implemented on existing and new locomotives; and (5) evaluate the abilities of representative locomotive cabs to support a static load.

RAILROAD RESEARCH AND DEVELOPMENT: SUMMARY RESULTS OF 70 TON BOXCAR TESTING PB83-153544/XPS

Kachadourian, G.

CORP. SOURCE- MITRE Corp., McLean, VA. METREK Div. JOURNAL VOL.- u8310 REPORT DATE- Apr 82 PAGINATION- 93p REPORT NO.- MTR-82W30 CONT. NO.- DTFR53-82-C-00087 MNTR. AGNCY.- FRA/ORD 82/23 NTIS Prices- PC A05/MF A01

Tests were performed at the Transportation Test Center in Pueblo, Colorado on a 70 ton boxcar with Barber S-2C trucks in April and May of 1981. The objective of the tests was to provide definition of the dynamic properties of the freight car for application to the validation of a mathematical model. The testing was conducted in two phases: static tests were performed on each truck to characterize their stiffness and damping properties; and vibration tests were performed on the complete boxcar, loaded and empty, to determine resonant frequencies. This report presents final results of

the truck stiffness tests and preliminary results of vibration tests. A comparison is presented between tests results and the math model to be validated.

RADIAL AXLE TRUCK TEST RESULTS REPORT. PB83-152983/XPS

Liles, M. Scofield, R.

CORP. SOURCE- ENSCO, Inc., Springfield, VA. JOURNAL VOL.- u8310 DESCRIP. NOTE- Final rept. REPORT DATE- Mar 82 PAGINATION- 99p CONT. NO.- DTFR53-80-C-00002 MNTR. AGNCY.- FRA/ORD 82/25, DOT-FR 82-06 NTIS Prices- PC A05/MF A01

This report describes the performance tests conducted on a pair of prototype radial axle trucks developed by GSI. The trucks tested were purchased from GSI by Amtrak and tested by FRA as a joint FRA/Amtrak project. The results of this test show that, as configured for this test, the trucks negotiated curves very well but did not have adequate high speed stability. The truck ran in curves up to 7.5 degrees with near zero wheel to rail angle-of-attack and exhibited no flange wear. Conventional trucks incurred significant flange damage from the constant operation at speeds above the balance speeds for the zero degrees 50 minutes curves on the test center RTT track. The radial trucks appeared to have adequate stability at speeds up to 120 mph when the wheels were new but the wheel profiles deteriorated within 10,000 miles. Wheel wear caused deterioration in the stability resulting in severe oscillations of the axles.

TRUCK DESIGN OPTIMIZATION PROJECT: PHASE II.
PB83-151423/XPS

RamaChandran, P. V. ElMadany, M. M. Glaser, R. J. Bakken, G. B.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8310 DESCRIP. NOTE- Final rept. Oct 77-Aug 81 REPORT DATE- Feb 82 PAGINATION- 170p REPORT NO.- WR-81-46 CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 81-48 NTIS Prices- PC A08/MF A01

The overall objectives of Phase II are to provide technological and economic bases for assessing freight car truck performance and design, and to generate uniform testing and performance guidelines for truck/carbody systems. This report summarizes the approaches employed in this study which included the development of a truck evaluation methodology to delineate the relationships between performance and railroad operating costs and profits; establishment of analytic and experimental procedures for relating truck parameters to the economic-based performance indices over the range of in-service train configurations, track conditions, equipment parameters, and speeds; and conduct of analytical and experimental studies to define the performance boundaries of existing and proposed freight car truck configurations. The report discusses the development of performance and test specifications, and the methodology used in defining economic implications.

RAILROAD CLASSIFICATION YARD TECHNOLOGY MANUAL. VOLUME III. FREIGHT CAR ROLLABILITY. PB83-150649/XPS

Wong, P. J. Stock, W. A. Hackworth, M. A. Petracek, S. J. Savage, N. P.

CORP. SOURCE- SRI International, Menlo Park, CA. JOURNAL VOL.- u8310 DESCRIP. NOTE- Final rept. REPORT DATE- Aug 82 PAGINATION- 149p CONT. NO.- DOT-TSC-1762 PROJ. NO.- SRI-8831 MNTR. AGNCY.- FRA/ORD 81/20.III NTIS Prices- PC A07/MF A01

The report presents a survey of rolling resistance research,

histograms of rolling resistance from five yards, a statistical regression analysis of causal factors affecting rolling resistance, procedures for constructing a rolling resistance histogram at a new yard, and an analysis of errors in the measurement of rolling resistance.

LOW COST CATENARY DESIGN-ANALYSIS. PB83-148700/XPS

Retallack, R. L. Doyle, G. R. Jr.

CORP. SOURCE- American Electric Power Service Corp., New York. JOURNAL VOL.- u8310 DESCRIP. NOTE- Final rept. on Tasks 1 and 2 Oct 80-Jul 81 REPORT DATE- Oct 81 PAGINATION- 121p CONT. NO.- DTFR53-80-C-00045 MNTR. AGNCY.- FRA/ORD 81/73 NTIS Prices- PC A06/MF A01

A new system of railroad electrification has been studied that requires only a single contact conductor as opposed to the conventional catenary system. Preliminary designs for the various components have been developed and are described. These include the traveller (that rides on the contact conductor), the traveller arm and the supports for the contact conductor. Various dynamic analysis models were developed including a six-degree of freedom model and a finite-element model to study the dynamic performance of the total system. Results of the interaction of the components are presented for various contact conductor diameters and tensions, for different span lengths between supports and for various vehicle (traveller) speeds.

ELECTRICAL TRACTION POWER SUPPLY CONFIGURATIONS ON 10000 ROUTE MILES OF U.S. RAILROADS. PB83-147975/XPS

Kneschke, T.

CORP. SOURCE- Electrack, Inc., Hyattsville, MD. JOURNAL VOL.- u8310 DESCRIP. NOTE- Final rept. Feb 80-Jun 82 REPORT DATE- Jun 82 PAGINATION- 422p CONT. NO.- DTRS57-80-C-00042 MNTR. AGNCY.- FRA/ORD 82/50 NTIS Prices- PC A18/MF A01

This report studies electrical traction power supply system configurations for 10,000 route miles of high density U.S.

freight railroads. Railroad and utility factors influencing the power supply configurations and costs are analyzed for these routes on a general and site-specific basis. Analytical procedures are developed for the design of the traction power supply systems. These techniques are used together with the site-specific data to define technically acceptable configurations for each route. Finally, the most cost-effective configuration for each route is identified after a cost analysis of the technically acceptable systems.

RAILROAD ELECTRIFICATION ACTIVITY: A SUMMARY REPORT 1980-1981. PB83-146787/XPS

Kidder, A. E.

CORP. SOURCE- Ebon Research Systems, Washington, DC. JOURNAL VOL.- u8310 DESCRIP. NOTE- Final rept. Jun 80-Jun 81 REPORT DATE- Apr 82 PAGINATION- 53p CONT. NO.- DTFR53-81-C-00226 MNTR. AGNCY.- FRA/ORD 82/53 NTIS Prices- PC A04/MF A01

This report reviews the status of railway electrification in North America and selected countries worldwide, for the period June, 1980 through June, 1981. Included in the report are updates on the extent of construction of electrification; research completed on feasibility studies and technical developments in engineering and design; a summary of cost-effectiveness studies which have explored the economics of railroad electrification during the period in question; a review of activities of U.S. engineering and architectural firms with experience in railway electrification; and, a synopsis of research on railway electrification which has been published during the period under review.

POWER CONDITIONING HARDWARE FOR AC TRACTION BASED ON UTILIZATION OF TLRV HARDWARE AND TECHNOLOGY.
PB83-148437/XPS

McLean, G. W.

CORP. SOURCE- AiResearch Mfg. Co. of California, Torrance. JOURNAL VOL.- u8309 DESCRIP. NOTE- Final rept. Oct 79-Jun 82 REPORT DATE- Jun 82 PAGINATION- 227p REPORT NO.- 81-18334 CONT. NO.- DOT-FR-9132 MNTR. AGNCY.- FRA/ORD 82/41 NTIS Prices- PC A11/MF AO1

This final report records the findings of an application study that investigated the feasibility of hardware and technology transfer to railroad traction of a multimegawatt power conditioning unit previously developed under sponsorship of the Department of Transportation. Various converter configurations capable of fulfilling the demanding traction requirements are presented. These converter drives are required to produce high starting torque combined with low torque pulsation and to demonstrate high efficiency. They are variants of the standard Graetz Bridge. These variants--all current-source converters--form three basic groups: (a) PWM, (b) multibridge, and (c) hidden-link. They supply either induction or synchronous traction motors and use either self- or machine-commutation. Also described is an experimental investigation into the feasibility of separating the boiling pool and condenser if two-phase Freon cooling of power semiconductors is used.

AN EXPERIMENTAL EVALUATION OF A FULL-SCALE SINGLE-SIDED LINEAR INDUCTION MOTOR WITH DIFFERENCE REACTION RAILS. VOLUME I: TEST RESULTS. PB83-143958/XPS

Bevan, R. J.

CORP. SOURCE- AiResearch Mfg. Co. of California, Torrance. JOURNAL VOL.- u8309 DESCRIP. NOTE- Final rept. REPORT DATE- Dec 81 PAGINATION- 308p REPORT NO.- 79-16095-1 CONT. NO.- DOT-FR-64226 MNTR. AGNCY.- FRA/ORD 80/77-1 NTIS Prices- PC A14/MF AO1

This document is the final volume in a series of reports presenting the results of an extensive test program involving the linear induction motor research vehicle

(LIMRV). Specifically, this report describes the final LIMRV test activity with a single-sided linear induction motor (SLIM). The principal objective was to evaluate motor performance with two types of reaction rails: aluminum plus solid iron (baseline configuration) and solid iron only. The test program encompassed measurement of SLIM propulsion characteristics, distributed parameters, track fluxes and associated parameters, and vertical force distribution.

LABORATORY STUDY TO DETERMINE THE EFFECTS OF TIE PAD STIFFNESS ON THE ATTENUATION OF IMPACT LOADS IN CONCRETE RAILWAY TIES. PB83-140244/XPS

Dean, F. E. Harrison, H. D.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8308 DESCRIP. NOTE- Interim rept. Apr-Jun 81 REPORT DATE- May 82 PAGINATION- 35p CONT. NO.- DOT-FR-9162 MNTR. AGNCY.- DOT/FRA/ORD 82/19 NTIS Prices- PC A03/MF A01

The effect of tie pad stiffness on the bending moments produced by impact loading of concrete railroad ties was investigated in laboratory tests. Controlled impact loads were applied to a one-tie test arrangement in which the pads were interchanged. Beginning with a rigid plastic pad currently in use on the Northeast Corridor track, the test loads reproduced the time history of bending strain which had been previously measured in track. It was also found that the initiation of bending cracks and their subsequent propagation closely matched crack development observed in track.

DESIGN STUDIES ON IRON-CORE SYNCHRONOUSLY OPERATING LINEAR MOTORS. PB83-145037/XPS

Levi, E.

CORP. SOURCE- Polytechnic Inst. of New York, Brooklyn. JOURNAL VOL.- u8307 DESCRIP. NOTE- Final rept. 1 Sep 75-31 Aug 78 REPORT DATE- Dec 81 PAGINATION- 211p REPORT NO.- POLYEE-81-003 CONT. NO.- DOT-FR-64227 MNTR. AGNCY.- FRA/ORD 81/74 NTIS Prices- PC A10/MF A01

This report concerns the design of iron-core synchronously-operating linear motors with passive rail track. Claw-pole and homopolar inductor motors were the 2 basic types considered. The principal conclusions were the homopolar inductor motor is the preferred form for the linear synchronous motor, two factors significantly influence the performance of the inductor type motor: flux leakage bridging the two armature halves in the interpolar space and iron saturation affecting preferentially the armature teeth under the poles. Both factors tend to decrease the difference in reluctance between the polar and the interpolar regions, although the weight of the inductor motor approaches that of the induction motor, a smaller power conditioner is required, tending to give the synchronous alternative a competitive edge, and the inductor motor has high lift and guidance forces almost independent of speed.

AN EXPERIMENTAL EVALUATION OF A FULL-SCALE SINGLE-SIDED LINEAR INDUCTION MOTOR WITH DIFFERENT REACTION RAILS. VOLUME II: SUPPLEMENTARY DATA. PB83-143966/XPS

Bevan, R. J.

CORP. SOURCE- AiResearch Mfg. Co. of California, Torrance. JOURNAL VOL.- u8307 DESCRIP. NOTE- Final rept. REPORT DATE- Dec 81 PAGINATION- 268p REPORT NO.- 79-16095-2 CONT. NO.- DOT-FR-64226 MNTR. AGNCY.- FRA/ORD 80/77-II NTIS Prices- PC A12/MF A01

This document presents supplementary data to Volume I: Test Results. It contains computer plots of all valid onboard data processed for 125 test runs, including baseline reaction rail tests for the 10- and 5-pole SLIM with dc and

ac excitation, and solid iron reaction rail tests for the 10-pole SLIM with 26- and 18-mm airgaps and with dc and ac excitation.

ANGLE OF ATTACK AND WHEEL-RAIL WEAR. PB83-131524/XPS

Kumar, S. Rao, D. L. Rajkumar, B. R.

CORP. SOURCE- Illinois Inst. of Tech., Chicago. JOURNAL VOL.- u8306 DESCRIP. NOTE- Technical rept. (Final) Jun-Dec 80 REPORT DATE- Dec 81 PAGINATION- 45p REPORT NO.- IIT-TRANS-81-2 CONT. NO.- DOT-FR-744-4301 MNTR. AGNCY.- FRA/ORD 82/40 NTIS Prices- PC A03/MF A01

Angle of attack is one of the most important parameters influencing wheel and rail wear. Some experiments conducted on the IIT-GMEMD 1/4.5 test facility to study wear of wheels and rails are reported. The angle of attack range covered is from theta=0.25 degrees to theta=1.00 degrees. The drastic reduction in wheel and rail life at high angles of attack is highlighted by comparison of the test results at 0.25 degrees and 0.76 degrees angle of attack. The adhesion-creepage behavior of wheel-rail contact in the longitudinal and lateral directions is examined and shown to be qualitatively similar for the two directions. Validity of the flange wear indices, obtained by the friction center method and those proposed by CN and Ghonem and Kalousek, are checked against the wear rates obtained in laboratory experiments.

RAILROAD ELECTROMAGNETIC COMPATIBILITY: COMPONENT SUSCEPTIBILITY. PB83-127761/XPS

Goodwyn, G. W.

CORP. SOURCE- Electromagnetic Compatibility Analysis Center, Annapolis, MD. JOURNAL VOL.- u8306 DESCRIP. NOTE- Final rept. REPORT DATE- Mar 82 PAGINATION- 109p REPORT NO.- ECAC-CR-82-030 MNTR. AGNCY.- DOT/FRA/ORD 82/15 NTIS Prices- PC A06/MF A01

Reported in this document are the results of electromagnetic interference (EMI) susceptibility tests performed at the

Electromagnetic Compatibility Test Facility, (EMCTF), Pueblo, CO in February and September 1981. The items tested were a broken joint and overrun detector (BJORD), a TRU-II receiver, two phase selective track circuits, a single rail track circuit, and an induction neutralizing transformer.

RAILROAD ELECTROMAGNETIC COMPATIBILITY: ENVIRONMENTAL TESTS AND COUPLING MEASUREMENTS. PB83-127753/XPS

Freeman, T.

CORP. SOURCE- Electromagnetic Compatibility Analysis Center, Annapolis, MD. JOURNAL VOL.- u8306 DESCRIP. NOTE- Final rept. Jul 80-Sep 81 REPORT DATE- May 82 PAGINATION- 58p REPORT NO.- ECAC-CR-82-010 MNTR. AGNCY.- DOT/FRA/ORD 82/14 NTIS Prices- PC A04/MF A01

Measurements were conducted at the Electromagnetic Compatibility Test Facility (EMCTF) at Pueblo, Colorado and documented for relevant characteristics of the environment, such as earth resistivity, resistance to remote earth (resistance to ground) of installed grounds, and the dc resistance of the cables that will be used for component testing. Measurements were conducted and documented for the voltage coupled to, i.e., induced into, representative cable conductors and between conductor pairs due to the voltage and current in the catenary. The applicability of analytical coupling models for calculating coupling between the catenary and the parallel communication and signal cables at the EMCTF was investigated.

RAILROAD ELECTROMAGNETIC COMPATIBILITY: ELECTRIC LOCOMOTIVE EMISSIONS FINAL REPORT PB83-127746/XPS

O'Neill, D. J.

CORP. SOURCE- Electromagnetic Compatibility Analysis Center, Annapolis, MD. JOURNAL VOL.- u8306 REPORT DATE- Jul 82 PAGINATION- 184p REPORT NO.- ECAC-CR-82-060 MNTR. AGNCY.- DOT/FRA/ORD 82/16 NTIS Prices- PC A09/MF A01

Empirical models of electric and magnetic field strengths external to the AEM-7 and E-60 locomotives are presented, as

well as representations of main transformer primary and rail currents. Additional sections of the report detail measurement procedures followed and data collected, along with a discussion of the data.

EVALUATION OF WHEEL-RAIL LOAD AND POSITION MEASUREMENT CONCEPTS. PB83-128512/XPS

Joyce, R. P. Johnson, M. R.

CORP. SOURCE- IIT Research Inst., Chicago, IL. JOURNAL VOL.- u8305 DESCRIP. NOTE- Final rept. REPORT DATE- Feb 82 PAGINATION- 46p CONT. NO.- DOT-FR-9049 MNTR. AGNCY.- FRA/ORD 82/20 NTIS Prices- PC A03/MF A01

Concepts for railroad vehicle-born instrumentation systems which measure wheel-rail loads and wheel position and angle-of-attack relative to the rail were identified and evaluated. A system which provided continuous measurement of lateral and vertical wheel loads, with an accuracy of plus or minus 2 percent of full scale load, and continuous measurement of wheel-rail angle-of-attack with plus or minus 0.5 milliradian (0.029 deg) accuracy was required. The work included a survey of current measurement concepts, the development of an evaluation procedure, the utilization of the procedure, and the development of suitable specifications. Six load measurement systems were considered, 5 based on instrumented wheel plates and one based on an instrumented axle and wheel bearing adapters. Four position measurement systems were evaluated, 2 based on contacting probes and 2 based on noncontacting probes. It was found that an instrumented wheel plate system must be utilized for wheel-rail force measurements if the desired performance standards are to be attained. It was also concluded that none of the wheel-rail position measurement systems would meet the desired performance characteristics.

PREDICTION OF RAIL BUCKLING: RECOMMENDATIONS FOR DEVELOPMENT OF TEST METHODS. PB83-124958/XPS

CORP. SOURCE- National Materials Advisory Board (NRC), Washington, DC. JOURNAL VOL.- u8304 DESCRIP. NOTE- Final rept. REPORT DATE- Mar 82 PAGINATION- 80p REPORT NO.- NMAB-388 CONT. NO.- DTFR53-80-C-00043 MNTR. AGNCY.- DOT/FRA/ORD 82/21 NTIS Prices- PC A05/MF A01

Railroad track structure can buckle if excessive compressive force is developed due to a temperature increase. The resulting misalignment can be a significant cause of train accidents. There is no practical method for measuring the longitudinal force without disturbing the track. Physical phenomena were reviewed in an effort to establish a basis for measuring longitudinal force. Various nondestructive testing techniques were considered, and it was concluded that no one of them applied singly is capable of providing an unambiguous practical measurement. Short-, medium-, and long-term recommendations are made, and the continued development of two methods (rail vibration and a magnetic technique) is endorsed. Fundamental studies also are recommended to provide the basis for a model that will identify the influence of texture, cold work, and other metallurgical properties on the measured results. Three specific areas are identified as showing promise but in need of sustained research.

IMPROVEMENT IN MAGNETIC TECHNIQUES FOR RAIL INSPECTION. PB83-124701/XPS

Falkenach, G. J. Kooger, D. J. Meister, R. P.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8304 DESCRIP. NOTE- Final rept. Aug 76- Dec 77 REPORT DATE- Jun 81 PAGINATION- 105p CONT. NO.- DOT-TSC-1244-1 MNTR. AGNCY.- DOT-TSC-FRA 81-14, FRA/ORD 81/49 NTIS Prices- PC A06/MF A01

Current inspection of rail for internal defects is carried out by ultrasonic and/or magnetic technique for inspecting rail for internal flaws. The major emphasis was placed on improving the speed and detectability of current techniques. Experimental work was performed directed toward determining

where and how improvements can be made with existing equipment and techniques. The three major areas investigated for improvement were magnetization, flaw sensors, and signal processing.

RAILCAR ROLLER BEARING FAILURE PROGRESSION TESTS.
PB83-110577/XPS

Waldron, W. D.

CORP. SOURCE- Shaker Research Corp., Ballston Lake, NY. JOURNAL VOL.- u8302 DESCRIP. NOTE- Final rept. Mar 78-Mar 79 REPORT DATE- Apr 82 PAGINATION- 130p REPORT NO.- 79-TR-48 CONT. NO.- DOT-TSC-1536 MNTR. AGNCY.- DOT-TSC-FRA 81-7, DOT/FRA/ORD 81/26 NTIS Prices- PC A07/MF A01

This report describes the laboratory endurance test of six railcar roller bearings that had previously suffered physical damage or were otherwise degraded as a result of actual railroad service. Two different onboard impending bearing failure sensors were also physically evaluated. The objectives of the tests were to obtain a better understanding of the railcar roller bearing failure process(es), the manner in which bearing defects progress, and the effectiveness of the impending failure warning devices. A 150 hour test with 26,250 pounds radial load (equivalent full car load) at 528 rpm (equivalent to approximately 52 mph) was planned for each bearing. Only one bearing actually failed to complete the 140 hour test. All bearings exhibited further measurable degradation of defect progression during the course of the tests. Neither warning device actually gave warning of the one failure experienced.

IMPROVEMENT OF RAILROAD ROLLER BEARING TEST PROCEDURES AND DEVELOPMENT OF ROLLER BEARING DIAGNOSTIC TECHNIQUES. VOLUME II: DIANOSTICS. PB83-107953/XPS

Waldron, W. D. McGrew, J. M. Krauter, A. I. Frarey, J. L.

CORP. SOURCE- Shaker Research Corp., Ballston Lake, NY. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. Oct 74-Apr 77 REPORT DATE- Apr 82 PAGINATION- 165p CONT. NO.- DOT-TSC-917 MNTR. AGNCY.- DOT-TSC-FRA 81-15-II, FRA/ORD 81/28.II NTIS Prices- PC A08/MF A01

A comprehensive review of existing basic diagnostic techniques applicable to the railcar roller bearing defect and failure problem was made. Of the potentially feasible diagnostic techniques identified, high frequency vibration was selected for experimental evaluation because it showed the most promise for implementation over a wide range of railroad deployment location requirements (from certification laboratory to trackside) and because it showed promise of being cost-effective while still providing a great deal of quantitative information regarding bearing condition. Tests were conducted in the laboratory on new and known faulty bearings and in a railroad wheel shop on berings of unknown quality. A mathematical model was developed to perform cost-benefit analyses of railcar roller bearing diagnostic approaches and procedural innovations. Results of the cost-benefit analyses that were made set the ground rules for allowable diagnostic system costs.

IMPROVEMENT OF RAILROAD ROLLER BEARING TEST PROCEDURES AND DEVELOPMENT OF ROLLER BEARING DIAGNOSTIC TECHNIQUES. VOLUME I: ACCEPTANCE TEST. PB83-107946/XPS

Waldron, W. D. McGrew, J. M. Krauter, A. I.

CORP. SOURCE- Shaker Research Corp., Ballston Lake, NY. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. Oct 74-Apr 77 REPORT DATE- Mar 82 PAGINATION- 246p CONT. NO.- DOT-TSC-917 MNTR. AGNCY.- DOT-TSC-FRA 81-15-I, FRA/ORD 81/28.I NTIS Prices- PC A11/MF A01

Bearing defect data from 8,000 railroad roller bearings are analyzed to determine their defect modes and defect rate

distributions. Cone bore growth, brinelling, and fatigue are identified as the predominant defect modes during the first 12 years of the aging process. The results of the study show that after approximately two years of service, 10 percent of all railroad roller bearings exhibit a defect of one type or another for which at least one component would be condemned if it were in a rework shop. The present AFBMA method of calculating fatigue spalling, modified to account for lubricant film thickness effects, correlates reasonably well with the observed incidence of spalling (10 percent fatigue life of about 11 years). The problem lies in the fact that AFBMA calculation procedure does not consider the other competing defect modes which contribute far more to the overall defect rate than spalling. The relationship between defect rate and failure rate is not direct, of course, and an examination of condemning limit definitions relative to the progression of bearing failure in service is needed.

MONITORING DEVICES FOR RAILROAD SAFETY SUPPLEMENT.
PB83-105635/XPS

Saunders, B. B. Koger, T. L.

CORP. SOURCE- National Space Technology Labs., NSTL Station, MS. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. May-Oct 80 REPORT DATE- Aug 82 PAGINATION- 241p MNTR. AGNCY.- DOT/FRA/ORD 82/46.2 NTIS Prices- PC A11/MF A01

Supplement to final report: Monitoring Devices for Railroad Safety of October 1980. This report is a compilation of sales brochures for the monitoring devices contained in the above mentioned report.

MONITORING DEVICES FOR RAILROAD SAFETY. PB83-105627/XPS

Saunders, B. B. Koger, T. L.

CORP. SOURCE- National Space Technology Labs., NSTL Station, MS. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. REPORT DATE- Aug 82 PAGINATION- 58p MNTR. AGNCY.- DOT/FRA/ORD 82/46.1 NTIS Prices- PC A04/MF A01

Chemical vapor detectors and heat detectors - telemetry systems were investigated for their suitability for railroad use. Safety in transporting hazardous chemicals can be increased by using systems designed to detect leaks of toxic and combustible vapor independent of any railroad incident and by using systems for the detection, identification, and quantification of spills resulting from railroad accidents or incidents. Three incidents under which chemical vapor monitoring would improve railroad safety associated with transporting hazardous chemicals are as follows: On-board monitoring (independent of a derailment or other railroad incident), incident monitoring (leak checks after small scale incidents), or response team monitoring (damage and hazard assessment of large railroad incidents). The principles of operation and the various unique features of detection instruments commercially available are discussed. The properties of explosives and heat detectors needed to monitor these explosives transported in railroad cars are discussed.

LONG-TERM ASSESSMENT OF PASSENGER GROUND TRANSPORTATION SYSTEM TECHNOLOGY. PB83-105411/XPS

Wormley, D. N. Goldie, J. H.

CORP. SOURCE- Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. Aug 79-Jan 82 REPORT DATE- Feb 82 PAGINATION- 144p CONT. NO.- DOT-FR-9097 MNTR. AGNCY.- DOT/FRA/ORD 82/48 NTIS Prices- PC A07/MF A01

In this study advanced intercity ground transportation has been reviewed to establish the present status and future directions of worldwide technology development. The study has focused in detail on noncontacting types of suspension and propulsion technology while citing significant

developments in the last decade of advanced, conventional rail systems placed into intercity revenue service. A limited analytical and experimental evaluation of hybrid types of systems employing noncontacting propulsion with conventional rail systems has been performed. A linear induction motor propulsion system for rail vehicles which utilizes conventional rail as the reaction rail has been studied using analytical models validated with scale model experimental test data for thrust normal force, efficiency and power factor.

VIBRATION TESTING OF RAILROAD TANK CAR SPECIMENS.
PB83-105023/XPS

Harris, J. E. Pierce, W. E.

CORP. SOURCE- National Space Technology Labs., NSTL Station, MS. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. Dec 80-Apr 81 REPORT DATE- May 82 PAGINATION- 61p MNTR. AGNCY.- DOT/FRA/ORD 82/28 NTIS Prices- PC A04/MF A01

Vibration tests of fireproof coatings were performed on test specimens measuring 4 feet square. Specimens were simulations of railroad tank car sidewall panels. Samples of fireproof coatings from three different manufacturers were tested. The vibration test consisted of application of a prescribed vibration spectrum perpendicular to the test panels, determination of natural resonances within the test frequency range, and examination of the test specimens for deterioration or failure of the coatings. Each panel was continuously vibrated during seven 12-minute duration long-sweeps, stepping from 10 Hz. at 0.5 G's to 200 Hz. at 1.5 G's. All six panels were tested (two from each manufacturer). No observable defects were noted on any of the six specimens. It is concluded that within the limits of the tests performed, all six panels performed satisfactorily.

SPECIAL ROUTING OF SPENT FUEL SHIPMENTS. PB83-105015/XPS

Berkowitz, R. L. Shaver, D. K. Rudd, T. J.

CORP. SOURCE- Systems Technology Lab., Inc., Arlington, VA. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. Dec 79-Apr 81 REPORT DATE- May 82 PAGINATION- 144p CONT. NO.- DOT-FR-4463 MNTR. AGNCY.- DOT/FRA/ORD 82/27 NTIS Prices- PC A07/MF A01

Special rail routing of spent fuel shipments from commercial nuclear power plants to Away-From-Reactor (AFR) storage and disposal sites has been proposed as one means of reducing the consequences and severity of radioactive materials accidents in areas of high population density. Whether or not special rail routing of spent fuel shipments does indeed decrease radiation exposure levels under normal and accident transportation conditions and at what incremental cost forms the basis of this study funded by the Federal Railroad Administration. The study is divided into five areas: (1) developing analytical models for assessing the risks associated with both the normal and accident transport modes; (2) selecting representative origin to destination routing pairs using the normal transportation and accident risk models; (3) analyzing rail shipment costs for nuclear spent fuel; and (4) performing sensitivity analyses to identify parameters that critically affect the total exposure level. The major findings resulting from this study are: (1) the risk over the seven example routes is relatively small for the normal transport mode; (2) the risk associated with an accident is at least an order of magnitude larger than the normal transport dose in all cases and as such is the overriding contribution to the total expected transport dose; and (3) no beneficial cost versus dose reduction relationship was found for any of the routes studied.

CHARACTERIZATION OF 105A TANK CARS AND THEIR USAGE PATTERNS IN TRANSPORTING HAZARDOUS MATERIALS. PB83-105007/XPS

CORP. SOURCE- Dynatrend, Inc., Philadelphia, PA. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. 1979-81. REPORT DATE- Aug 82 PAGINATION- 85p MNTR. AGNCY.- FRA/ORD 81/82 NTIS Prices- PC A05/MF A01

This study is an extensive investigation of the characteristics, use, and safety experience of Department of Transportation Specification 105 rail tank cars.

THE FLOW OF LIQUIDS AND GASES THROUGH RAIL TANK CAR SAFETY VALVES. PB83-104992/XPS

Sallet, D. W. Weske, J. R. Guhler, M.

CORP. SOURCE- Maryland Univ., College Park. Dept. of Mechanical Engineering. JOURNAL VOL.- u8301 DESCRIP. NOTE- Final rept. REPORT DATE- Jul 82 PAGINATION- 30p CONT. NO.- DOT-FR-64181 MNTR. AGNCY.- DOT/FRA/ORD 81/34 NTIS Prices- PC A03/MF A01

The design of safety systems for rail tank cars carrying pressurized gases and liquids is dependent on the knowledge of the venting rates which can be achieved through the safety valves. This article summarizes a series of investigations of the flow of liquids and gases through spring loaded safety valves. It was found that the valve coefficients for liquid flow are nearly 30% smaller than for choked vapor flow. Valve coefficients remain nearly the same when pure liquid flow changes to very low quality two-phase flow, while, as expected, the mass flow rates decrease. It was found that during choked vapor flow entrainment of liquid droplets significantly reduces the vapor flow rates and therefore the venting capability of the valves. The two particular valves investigated here are of the same type, size and manufacture as those currently installed on specification 112 and 114 rail tank cars.

FUEL EFFICIENT TRAIN OPERATIONS: A PRELIMINARY INVESTIGATION WITH THE LOCOMOTIVE DATA ACQUISITION PACKAGE ON THE UNION PACIFIC RAILROAD. PB82-232729/XPS

Larsen, K. W.

CORP. SOURCE- Dynamic Science, Inc., Fairfax, VA. JOURNAL VOL.- u8221 DESCRIP. NOTE- Interim rept. Jun-Nov 80 REPORT DATE- Dec 81 PAGINATION- 57p CONT. NO.- DOT-FR-9048 MNTR. AGNCY.- DOT/FRA/ORD 81/50 NTIS Prices- PC A04/MF A01

The Locomotive Data Acquisition Package (LDAP) is a research data acquisition system designed for use on board diesel locomotives. Between June 1980 and November 1980, a fuel efficient train operations experiment was conducted in cooperation with the Union Pacific Railroad using the LDAP. The experiment served both as a checkout of the LDAP unit, and as a preliminary study of the relationship between train handling and fuel consumption. The LDAP unit was operated on a Union Pacific Locomotive for 127 days during which data were collected for 53,936 miles of locomotive operation.

A PROTOTYPE MAINTENANCE-OF-WAY PLANNING SYSTEM. VOLUME IV: VALIDATION OF THE PROTOTYPE MOW PLANNING SYSTEM. PB82-224270/XPS

Sawyer, D. Hamid, A. Rasmussen, K.

CORP. SOURCE- ENSCO, Inc., Springfield, VA. JOURNAL VOL.- u8221 DESCRIP. NOTE- Technical rept. Oct 79-Jun 81 REPORT DATE- Oct 81 PAGINATION- 73p CONT. NO.- DTFR53-80-C-00002 MNTR. AGNCY.- FRA/ORD 80/47, DOT-FR 81-19 NTIS Prices- PC A04/MF A01

The past Track Quality Indices (TQI's) and prediction equations of the Maintenance-of-Way (MOW) Program were analyzed from a validation standpoint by reviewing track degradation, residual analysis, and regression analysis in 124 unmaintained track segments. The results of this study supported many of the concepts of the prototype maintenance-of-way planning system; however some concepts were contradicted. It should be pointed out that this study was based on a somewhat different and smaller test zone than in earlier studies. This study used a test zone with less

traffic, more curves, and predominantly continuously welded rail. Track geometry data was measured by the FRA T-6 track geometry vehicle.

ANTHOLOGY OF RAIL DYNAMICS RESEARCH. PB82-217993/XPS

Shladover, S. E.

CORP. SOURCE- Systems Control Technology, Inc., Palo Alto, CA. JOURNAL VOL.- u8221 DESCRIP. NOTE- Final rept. Mar 81-Apr 82 REPORT DATE- Jun 82 PAGINATION- 36p CONT. NO.- DOT-FR-9050 MNTR. AGNCY.- FRA/ORD 82/37 NTIS Prices- PC A03/MF A01

This report is intended to provide the railroad industry and other interested parties with an anthology of recent technical information of long term value which has resulted from FRA-sponsored studies of rail system dynamics. This anthology includes brief descriptions of FRA contract reports and professional papers based on FRA contract work in the areas of wheel-rail interface phenomena, track characteristics, vehicle dynamics, vehicle-track interactions, longitudinal train dynamics, train resistance and lading response. A comprehensive bibliography of these documents is included to aid the user of this report in finding the documents of greatest interest to him.

USER'S MANUAL FOR PROGRAM CONWHEEL (CONFORMAL WHEEL-RAIL CONTACT STRESS PROBLEMS). PB82-220518/XPS

Paul, B. Singh, S.

CORP. SOURCE- Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics. JOURNAL VOL.- u8220 DESCRIP. NOTE- Technical rept. no. 10 (Final) May-Oct 81 REPORT DATE- Mar 82 PAGINATION- 80p CONT. NO.- DTFR53-81-C-00227 MNTR. AGNCY.- FRA/ORD 82/36 NTIS Prices- PC A05/MF A01

CONWHEEL (CONformal WHEEL-rail contact stress problems) is an all FORTRAN computer program for the solution of normal contact stresses between two closely conforming (possibly nonHertzian) smooth elastic bodies. It can be used to

determine: the boundary of the interface contact region; pressure distribution; stress within the critical subsurface region. CONWHEEL is a much enhanced version of an earlier program CONFORM. This manual includes: a brief description of the method of analysis, program structure, instructions for problem modelling, input preparation, and solution of sample problems.

LOCOMOTIVE TRACK HAZARD DETECTOR PROGRAM (LTHD).
PB82-217167/XPS

Corbin, J. Lazzaro, J. Peterson, C.

CORP.. SOURCE- MITRE Corp., McLean, VA. JOURNAL VOL.- u8220 DESCRIP. NOTE- Final rept. REPORT DATE- Jun 82 PAGINATION- 48p REPORT NO.- MTR-81W040 CONT. NO.- DOT-FR-54090 MNTR. AGNCY.- FRA/ORD 82/26 NTIS Prices- PC A03/MF A01

This report summarizes work performed by The MITRE Corporation for the Federal Railroad Administration Office of Rail Safety Research to develop a Locomotive Track Hazard Detector (LTHD). The objective of the LTHD program was to develop a simple and inexpensive unmanned track geometry measurement capability that could be used by the railroads to detect unsafe track conditions during routine revenue operations. The results of LTHD computer analysis and field testing phases are described.

HIGH CANT DEFICIENCY TESTING OF THE LRC TRAIN THE AEM-7 LOCOMOTIVE AND THE AMCOACH. PB82-213018/XPS

Boyd, P. L. Scofield, R. E. Zaiko, J. P.

CORP. SOURCE- ENSCO, Inc., Springfield, VA. JOURNAL VOL.- u8219 DESCRIP. NOTE- Final rept. REPORT DATE- Jan 82 PAGINATION- 257p REPORT NO.- ENSCO-1444-207 CONT. NO.- DOT-FR-DTFR53-80-C-00002 MNTR. AGNCY.- DOT-FR 81-06 NTIS Prices- PC A12/MF A01

Increasing the speed of passenger trains in existing curves has been proposed as an alternative to changing curve radii for the purpose of reducing trip times on the Northeast

Corridor. This test evaluates safety at high cant deficiency by comparing direct wheel/rail force measurements to safety criteria from world-wide sources. Tests were performed on the advanced LRC train with banking coaches and the modern but conventional AEM-7 Locomotive and Amcoach.

EVALUATION OF SIGNAL/CONTROL SYSTEM EQUIPMENT AND TECHNOLOGY. TASK 7: SUMMARY AND FINAL REPORT. PB82-213000/XPS

Taylor, S. F.

CORP. SOURCE- STV, Inc., Pottstown, PA. JOURNAL VOL.- u8219 DESCRIP. NOTE- Rept. for Oct 77-Sep 81 REPORT DATE- Sep 81 PAGINATION- 49p CONT. NO.- DOT-FR-773-4236 MNTR. AGNCY.- FRA/ORD 78/39.7 NTIS Prices- PC A03/MF A01

This report describes the objectives and procedures of the evaluation. It then summarizes the findings contained in each of six task reports. Those published reports are: Assessment of Signal/Control Technology and Literature Review; Status of Present Signal/Control Equipment; Standardization, Signal Types, Titles; Electrical Noise Disturbance; Economic Studies; and Specification Development. The report concludes with an analysis of the electromagnetic environment produced by electrification and proposes what steps should be taken to protect signal/control systems from harmful interference.

RAILROAD FINANCIAL EVALUATION MODEL: DESCRIPTION AND COMPUTER PROGRAM USERS' MANUAL. PB82-200395/XPS

Kane, J. A. Waldman, C. E.

CORP. SOURCE- Bolt Beranek and Newman, Inc., Cambridge, MA. JOURNAL VOL.- u8218 DESCRIP. NOTE- Final rept. Sep 78-Feb 81 REPORT DATE- Aug 81 PAGINATION- 96p REPORT NO.- BBN-4632 CONT. NO.- DOT-FR-8091 MNTR. AGNCY.- FRA/ORD 81/25.II NTIS Prices- PC A05/MF A01

This report is part of a larger study to identify potentially cost-effective advanced braking and coupling

systems and to prepare a plan for conducting the research and development needed to bring about implementation of these systems. This report describes a model for determining the economic feasibility of implementing advanced braking and coupling systems. First the financial analysis concept of a discounted cash flow is explained. That analysis technique is then adapted for a user-oriented computer model. Several example cases are then presented to demonstrate the actual operation of the model.

CHARACTERIZATION OF RELATIVELY LARGE TRACK GEOMETRY VARIATIONS. PB82-196460/XPS

CORP. SOURCE- ENSCO, Inc., Springfield, VA. JOURNAL VOL.- u8216 DESCRIP. NOTE- Final rept. Dec 78-Oct 79 REPORT DATE- Mar 82 PAGINATION- 144p CONT. NO.- DOT-TSC-1631 MNTR. AGNCY.- FRA/ORD 82/13, DOT-TSC-FRA 81-18 NTIS Prices- PC A07/MF A01

An analysis of existing track geometry data is described from which the signatures of key track geometry variations related to severe track-train dynamic interaction are identified and quantified. Mathematical representations of these signatures are defined and presented. Track geometry descriptors used to monitor these key signatures are determined. Applications of these descriptors in terms of present track geometry measurement techniques are described. Statistical analysis of these descriptors is performed and the results are presented. Based on limited data preliminary results to quantify changes in these descriptors with time are presented.

ALLOCATING LOSS AND DAMAGE TO THE RAILROAD TRANSPORT CYCLE.
PB82-195587/XPS

Wong, P. J.

CORP. SOURCE- SRI International, Menlo Park, CA. JOURNAL VOL.- u8216 DESCRIP. NOTE- Final rept. REPORT DATE- Dec 81 PAGINATION- 74p CONT. NO.- DOT-FR-9082 MNTR. AGNCY.- FRA/ORD 81/64 NTIS Prices- PC A04/MF A01

This report presents a methodology for allocating loss and damage costs to various elements of the railroad transport cycle. Estimates of loss and damage attributed to linehaul shock and vibration and flat and hump yard coupling impacts are provided. In addition, loss and damage estimates are provided for various levels of overspeed impacts in hump yards. The methodology is also extended to allocate coupler damage to train-slack action and yard coupling impacts.

MECHANICS OF BALLAST COMPACTION. VOLUME 5: SUMMARY REPORT.
PB82-192212/XPS

Selig, E. T. Panuccio, C. M. Yoo, T. S.

CORP. SOURCE- State Univ. of New York at Buffalo. Dept. of Civil Engineering. JOURNAL VOL.- u8216 DESCRIP. NOTE- Final rept. Jan 76-Sep 79 REPORT DATE- Mar 82 PAGINATION- 118p CONT. NO.- DOT-TSC-1115 MNTR. AGNCY.- DOT-TSC-FRA 81-3.V, FRA/ORD 81/16.5 AVAIL. NOTE- Also available in set of 5 reports PC E99, PB82-192162. NTIS Prices- PC A06/MF A01

This report summarizes the results of research on the mechanics of ballast compaction. Details are provided in four preceeding reports. The scope of this summary includes: (1) a description of ballast physical state, (2) methods developed for measuring the physical state in-situ, (3) the effects of tamping, traffic and compaction on ballast physical state, (4) the influence of compaction parameters on the amount of compaction, (5) an assessment of the benefits of crib and shoulder compaction, and (6) recommendations for further research.

MECHANICS OF BALLAST COMPACTION. VOLUME 4: LABORATORY INVESTIGATION OF THE EFFECTS OF FIELD COMPACTION MECHANISMS. PB82-192204/XPS

Panuccio, C. M. McMahon, D. R. Selig, E. T.

CORP. SOURCE- State Univ. of New York at Buffalo. Dept. of Civil Engineering. JOURNAL VOL.- u8216 DESCRIP. NOTE- Final rept. Jan 76-Sep 79 REPORT DATE- Mar 82 PAGINATION- 137p CONT. NO.- DOT-TSC-1115 MNTR. AGNCY.- DOT-TSC-FRA 81-3.IV, FRA/ORD 81/16.4 AVAIL. NOTE- Also available in set of 5 reports PC E99, PB82-192162. NTIS Prices- PC A07/MF A01

This report describes a preliminary series of laboratory tests which attempt to simulate some of the effects of maintenance procedures and traffic on the physical state of ballast as measured by the ballast density test, plate load test, and lateral tie push test. The first part of the report examines ballast compaction with a commercial vibratory plate. The second part considers manual tie tamping. The third part investigates the effect of cyclic loading of ballast with a surface plate, which represents plates on crib and shoulder compaction machines. Vibratory compaction and traffic were shown to be effective means of compacting ballast. However, more research is needed to quantify the effects of the controlling variables.

MECHANICS OF BALLAST COMPACTION.VOLUME 3: FIELD TEST RESULTS FOR BALLAST PHYSICAL STATE MEASUREMENT. PB82-192196/XPS

Panuccio, C. M. Yoo, T. S. Selig, E. T.

CORP. SOURCE- State Univ. of New York at Buffalo. Dept. of Civil Engineering. JOURNAL VOL.- u8216 DESCRIP. NOTE- Final rept. Jan 76-Sep 79 REPORT DATE- Mar 82 PAGINATION- 195p CONT. NO.- DOT-TSC-1115 MNTR. AGNCY.- DOT-TSC-FRA 81-3.III, FRA/ORD 81/16.3 AVAIL. NOTE- Also available in set of 5 reports PC E99, PB82-192162. NTIS Prices- PC A09/MF A01

The important mechanical processes which influence the ballast physical state in track are tamping, crib and shoulder compaction and train traffic. Three methods of assessing physical state were used at four railroad sites to

obtain needed data on the effect of these processes. The methods were: ballast density test, plate load test, and lateral tie push test. The available information from previous studies was also compiled and compared to the new information gathered in this study. The primary objective of this research was to evaluate the usefulness of crib and shoulder compaction in the maintenance of track. The research showed that the effects of tamping and compaction on ballast state depend significantly on the state existing prior to maintenance. For a track in service, tamping generally loosens the ballast. Crib and shoulder compaction primarily densifies the crib, but it also improves the ballast stiffness under the tie. Train traffic had the most influence on ballast physical state. After loosening from tamping, the ballast again reaches its stable physical state within 20 MGT of train traffic. Adding crib and shoulder compaction produced the same physical state as about 0.2 MGT traffic, and the effects of this compaction were not distinct from tamped-only track after about 2 MGT of traffic.

MECHANICS OF BALLAST COMPACTION. VOLUME 2: FIELD METHODS FOR BALLAST PHYSICAL STATE MEASUREMENT. PB82-192188/XPS

Selig, E. T. Yoo, T. S. Panuccio, C. M.

CORP. SOURCE- State Univ. of New York at Buffalo. Dept. of Civil Engineering. JOURNAL VOL.- u8216 DESCRIP. NOTE- Final rept. Jan 76-Sep 79 REPORT DATE- Mar 82 PAGINATION- 208p CONT. NO.- DOT-TSC-1115 MNTR. AGNCY.- DOT-TSC-FRA 81-3.II, FRA/ORD 81/16.2 AVAIL. NOTE- Also available in set of 5 reports PC E99, PB82-192162. NTIS Prices- PC A10/MF A01

Field methods for measuring ballast physical state are needed to study the effects of ballast compaction. Following a consideration of various alternatives, three methods were selected for development and evaluation. The first was in-place density, which provides a direct measure of compaction. An approach involving water replacement in a membrane-lined hold was devised. A reference density test using a steel container and an impact hammer was also developed. The second was a bearing test using a 5-inch-diameter plate. The load for a specified settlement is proposed as a measure of the in-place ballast stiffness. Plaster of paris was found to be the best method for seating the plate on the ballast. The third method involved the

resistance of a tie to lateral force. This is the only one of the three used significantly in track studies in the past. The force required to displace the tie by a specified amount was designated as an indirect measure of ballast physical state around the tie. Laboratory tests were conducted to evaluate the factors influencing this force. Appendices to the report describe the apparatus and procedures for the field tests that evolved after considerable field experience with the methods. This report is Volume 2 of the Final Report on the mechanics of ballast compaction.

MECHANICS OF BALLAST COMPACTION. VOLUME I: TECHNICAL REVIEW OF BALLAST COMPACTION AND RELATED TOPICS. PB82-192170/XPS

Selig, E. T. Yoo, T. S. Panuccio, C. M.

CORP. SOURCE- State Univ. of New York at Buffalo. Dept. of Civil Engineering. JOURNAL VOL.- u8216 DESCRIP. NOTE- Final rept. Jan 76-Sep 79 REPORT DATE- Mar 82 PAGINATION- 307p CONT. NO.- DOT-TSC-1115 MNTR. AGNCY.- DOT-TSC-FRA 81-3.I, FRA/ORD 81/16.1 AVAIL. NOTE- Also available in set of 5 reports PC E99, PB82-192162. NTIS Prices- PC A14/MF A01

The purpose of the research program on the mechanics of ballast compaction is to determine the influence of mechanical compaction on the ballast physical state and its consequence on the performance of the track structure. This report, which is one of a series for this project, presents the results of an extensive literature review on ballast compaction and related topics. The topics covered are the track system components, aggregate material characterization, mechanics of granular materials, compaction of granular materials, present practice of ballast related track construction and maintenance, relationship of ballast compaction to track performance, assessment of effects of compactor parameters, and economics of track maintenance.

LOCOMOTIVE DATA ACQUISITION PACKAGE. VOLUME II: OPERATIONS AND MAINTENANCE. PB82-192329/XPS

Abbott, R. K. Kirsten, F. A. Mullen, D. R. Sidman, S. B. Miller, J. G.

CORP. SOURCE- California Univ., Berkeley. Lawrence Berkeley Lab. JOURNAL VOL.- u8215 DESCRIP. NOTE- Final rept. Jun 78-Dec 81 REPORT DATE- Mar 82 PAGINATION- 109p REPORT NO.- LBL-10614 MNTR. AGNCY.- FRA/ORD 82/09.II NTIS Prices- PC A06/MF A01

The Locomotive Data Acquisition Package (LDAP) is a complete data acquisition system designed specifically for use on board railroad locomotives to study locomotive performance while in normal over-the-road operations. It is a semi-portable system requiring only limited installation support commonly found in railroad shops. The system may be applied to study energy conservation measures as well as train dynamics. The system described consists of a magnetic tape digital data recorder, an ensemble of transducers, and analysis software. This volume discusses the operation and maintenance of the Locomotive Data Recorder (LDR) which is the heart of the LDAP system.

LOCOMOTIVE DATA ACQUISITION PACKAGE. VOLUME I.: SYSTEM DEVELOPMENT OVERVIEW. PB82-192311/XPS

Abbott, R. K. Kirsten, F. A. Mullen, D. R. Sidman, S. B. Miller, J. G.

CORP. SOURCE- California Univ., Berkeley. Lawrence Berkeley Lab. JOURNAL VOL.- u8215 DESCRIP. NOTE- Final rept. Jun 78-Dec 81 REPORT DATE- Mar 82 PAGINATION- 161p REPORT NO.- LBL-10614 MNTR. AGNCY.- FRA/ORD 82/09.I NTIS Prices- PC A08/MF A01

An examination of the problems associated with railroad locomotive data acquisition is presented. The design of a minicomputer based locomotive data acquisition system is also presented. Special attention is placed on meeting the functional characteristics and environmental specifications required for the system. The system described consists of a magnetic tape digital tape recorder, an esemble of transducers, and analysis software. The system described is

designed as a research tool. The environmental test program and the field test program for the preprototype system are also described. The Locomotive Data Acquisition Package (LDAP) is a complete data acquisition system designed specifically for use on board railroad locomotives to study locomotive performance while in normal over-the-road operations. It is a semi-portable system requiring only limited installation support commonly found in railroad shops. The system may be applied to study energy conservation measures as well as train dynamics.

USER'S GUIDE FOR A COMPUTERIZED TRACK MAINTENANCE SIMULATION COST METHODOLOGY. PB82-181587/XPS

Smith, R. L. Krauter, A. I. Betor, J.

CORP. SOURCE- Shaker Research Corp., Ballston Lake, NY.
JOURNAL VOL.- u8213 DESCRIP. NOTE- Final rept. Sep 78-Sep 80 REPORT DATE- Feb 82 PAGINATION- 305p CONT. NO.- DOT-TSC-1594 MNTR. AGNCY.- FRA/ORD 82/08, DOT-TSC-FRA 81-12 NTIS Prices- PC A14/MF A01

This User's Guide describes the simulation cost modeling technique developed for costing of maintenance operations of track and its component structures. The procedure discussed provides for separate maintenance cost entries to be associated with definable track substructures such as rail, cross ties, or ballast. In this manner separate tabulations of maintenance expenditures can be obtained from the computerized technique. This guide describes the background of the technique as well as provides two examples of the application of the costing procedure. The maintenance costing examples provided illustrate the use of maintenance action diagrams representing the system being modeled. The two-example systems involve time-dependent cost estimating and produce costs-by-year for the class of track; component or sub-structure repaired; type of maintenance operation; as well as by several costing subcategories including labor, material, equipment, delays, scrap, fines, etc. Although the computer program is tailored specifically for track maintenance analysis. Time-dependent aspects of costs, which can vary with track loading MGT, railroad policy, track component quality, and/or Federal Safety Standards, can be entered in the simulation with the aid of user definable functions.

ANALYSIS OF RAILROAD TRACK MAINTENANCE EXPENDITURES FOR CLASS I RAILROADS 1962-1977. PB82-181579/XPS

Tyworth, J. E. Reinschmidt, A. J. Koot, R. S. Spychalski, J. C.

CORP. SOURCE- Pennsylvania Transportation Inst., University Park. JOURNAL VOL.- u8213 DESCRIP. NOTE- Final rept. Jan 78-Dec 80 REPORT DATE- Feb 82 PAGINATION- 146p CONT. NO.- DOT-TSC-1675 MNTR. AGNCY.- FRA/ORD 82/07, DOT-TSC-FRA 81-20 NTIS Prices- PC A07/MF A01

This study investigates the decision-making process for railroad track maintenance (T/M) expenditures. The objectives are to (1) describe how Federal track safety standards have influenced this process and (2) try to predict the impact of changes in safety regulations on T/M spending for all U.S. Class I railroads on selected groups of railroads. A related objective of this study was to use publicly available data to build models of track-related accidents and train speeds. The approach used in this research included a literature search, field interviews, hypotheses testing through models and case analysis, and multivariate analysis of time series data in cross sections. The scope of the study was limited to the Class I railroads operating in 1978 and from 1962 to 1977. The results suggest that imposition of FRA standards has had the predicted impacts on both T/M spending and on train speeds. Since the standards were imposed, railway revenues for T/M have increased. In addition, the standards appear to have had a negative influence on average train speeds, though they have not effected a reduction in track-related accidents.

ANALYSIS OF THE BEHAVIORAL RELATIONSHIPS OF RAILROAD TRACK MAINTENANCE SPENDING. PB82-181561/XPS

LePage, R. G.

CORP. SOURCE- Dynatrend, Inc., Woburn, MA. JOURNAL VOL.- u8213 DESCRIP. NOTE- Final rept. REPORT DATE- Jan 78-Dec 80 PAGINATION- 215p CONT. NO.- DOT-TSC-1679 MNTR. AGNCY.- FRA/ORD 82/06, DOT-TSC-FRA 81-19 NTIS Prices- PC A10/MF A01

This report summarizes the activities and results of the

research effort on Class I railroads operating in 1978 and between 1962 and 1977. Five tasks have been presented as follows: (1) industry interviews, (2) hypothesis development, (3) data acquisition, (4) model development, and (5) forecast and assessment of results through the year 1990. Application of the model to the 1978-90 forecast for the Class I industry as a whole demonstrated the utility of the model as a means of assisting Federal policy evaluation and analysis.

ENGINEERING DATA CHARACTERIZING THE FLEET OF U.S. RAILWAY ROLLING STOCK. VOLUME II: METHODOLOGY AND DATA.
PB82-181553/XPS

Przybylinski, P. G. Anderson, G. B.

CORP. SOURCE- Pullman Standard Co., Hammond, IN. JOURNAL VOL.- u8213 DESCRIP. NOTE- Final rept. REPORT DATE- Nov 81 PAGINATION- 278p CONT. NO.- DOT-TSC-1362-2 MNTR. AGNCY.- FRA/ORD 81/75.2, DOT-TSC-FRA 81-16-II NTIS Prices- PC A13/MF A01

This report contains engineering parameter descriptions of major and distinctive freight vehicle configurations covering approximately 96% of the U.S. freight vehicle fleet. This data has been developed primarily for use in analytical simulation modeling of rail vehicles to analyses of vehicle/track dynamic interaction dynamics. To characterize loaded freight vehicles, representative ladings and average load conditions were defined, and load-dependent characterizations were developed for each major vehicle/lading combination. Freight truck design data was assembled and correlated with carbody descriptions, and some typical freight vehicle wheel profiles were defined based on a field measurement survey. Population data and estimates of total annual mileage traveled by each vehicle and vehicle/lading combination are also provided. Engineering parameter descriptions of major locomotive and passenger vehicle design groups are also provided. The concept of generically similar railcar configurations is also introduced as a practical and cost effective approach to analyzing large numbers of vehicles in rail system dynamics studies. This volume contains the fleet characterization data and describes the detailed methodology used to generate the data.

ENGINEERING DATA CHARACTERIZING THE FLEET OF U.S. RAILWAY ROLLING STOCK. VOLUME I: USER'S GUIDE. PB82-181546/XPS

DiMasi, F. P.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA.
JOURNAL VOL.- u8213 DESCRIP. NOTE- Final rept. Jul 77-Apr 80 REPORT DATE- Nov 81 PAGINATION- 91p REPORT NO.- DOT-TSC-FRA-81-16-I MNTR. AGNCY.- FRA/ORD 81-75-1 NTIS Prices- PC A05/MF A01

This report contains engineering parameter descriptions of major and distinctive freight vehicle configurations covering approximately 96% of the U.S. freight vehicle fleet. This data has been developed primarily for use in analytical simulation modeling of rail vehicles to analyses of vehicle/track dynamic interaction dynamics. To characterize loaded freight vehicles, representative ladings and average load conditions were defined, and load-dependent characterizations were developed for each major vehicle/lading combination. Freight truck design data was assembled and correlated with carbody descriptions, and some typical freight vehicle wheel profiles were defined based on a field measurement survey. Population data and estimates of total annual mileage traveled by each vehicle and vehicle/lading combination are also provided. Engineering parameter descriptions of major locomotive and passenger vehicle design groups are also provided. The concept of generically similar railcar configurations is also introduced as a practical and cost effective approach to analyzing large numbers of vehicles in rail system dynamics studies. This volume is user oriented containing (a) a summary description of data developed, (b) a detailed data directory to facilitate access to data contained in appendices of Volume II, and (c) supplemental comments on elements of the detailed methodology.

CHARACTERIZING THE PERFORMANCE OF CAST-IRON HIGH-PHOSPHORUS CAST-IRON AND COMPOSITION FREIGHT CAR BRAKE SHOES UNDER SIMULATED DRAG BRAKING CONDITIONS. PB82-170028/XPS

Boghani, A. B.

CORP. SOURCE- Little (Arthur D.), Inc., Cambridge, MA. JOURNAL VOL.- u8213 DESCRIP. NOTE- Final rept. REPORT DATE- Jan 81 PAGINATION- 61p REPORT NO.- ADL-80589-75 CONT. NO.- DOT-FR-74261 MNTR. AGNCY.- FRA/ORD 81/08 NTIS Prices- PC A04/MF A01

The performance of the cast-iron, high-phosphorus cast-iron, and composition brake shoes was evaluated through a test program under conditions simulating the operation of a loaded 70-ton freight car on a long downgrade or 'stuck brake' situation. The major part of the test program dealt with brake tests at constant speeds of 20, 30, and 40 mph with about 30 bhp energy-dissipation rate. Additional tests included simulating 'worst-usage cases' and those conducted to determine the effects of a rolling-contact load, partial shoe contact, and brake-shoe force magnitude on the performance of three types of shoes. During each test, the braking torque, the wheel temperature, and the strain in the wheel were measured.

TRUCK DESIGN OPTIMIZATION PROJECT PHASE II: WEAR DATA COLLECTION PROGRAM REPORT--VOLUME II. PB82-168204/XPS

Bakken, G. B. Jones, C. W. Schmidt, W. R.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8211 DESCRIP. NOTE- Technical rept. Apr 79-Mar 81 REPORT DATE- Aug 81 PAGINATION- 342p REPORT NO.- TDOPTR-15-VOL-2 CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 81/37.II NTIS Prices- PC A15/MF A01

This volume of the Wear Data Collection Program Report contains the measurements taken at each cycle on the eight Type I and II trucks in the program. For assistance in reading the computer printouts, see Table 1 which lists each type of measurement taken and indicates whether the measurements increase or decrease with wear (e.g., when two points on the same part wear away from each other, the

intervening distance increases). In addition, the table shows the code used on the computer printout to identify the various measurements.

TRUCK DESIGN OPTIMIZATION PROJECT PHASE II: WEAR DATA COLLECTION PROGRAM REPORT--VOLUME I. PB82-168196/XPS

Bakken, G. B. Jones, C. W. Schmidt, W. R.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8211
DESCRIP. NOTE- Technical rept. Apr 79-Mar 81 REPORT DATE- Aug 81 PAGINATION- 281p REPORT NO.- TDOPTR-15-VOL-1
CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 81/37.I
NTIS Prices- PC A13/MF A01

This program is part of the field studies conducted during the TDOP Phase II Project. TDOP is designed to examine the performance of various freight car truck designs with the objective of improving the efficiency and productivity of rail freight transportation. Maintenance and repair costs of truck components constitute an important factor in the cost-effectiveness of a particular truck design. In the program, Type I trucks (standard), three-piece trucks) and Type II trucks (trucks with design features which functionally change truck/carbody behavior) were placed in revenue service in unit coal trains. The objectives were to collect wear data, establish wear trends, evaluate various measurement techniques, develop a measurement schedule, and provide input to economic models. The plan, procedures, and data base description of the program are contained in Appendices A, B, and C, of Volume I. The trucks were periodically removed from service, disassembled, and measured for wear. Approximately 1,000 wear measurements were taken on each truck at each measurement interval. These measurements are contained in Volume II.

TRUCK DESIGN OPTIMIZATION PROJECT. PHASE II: TYPE II TRUCK TEST RESULTS REPORT. PB82-152018/XPS

Peacock, R. A. Gibson, D. W.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8209
DESCRIP. NOTE- Technical rept. Apr-Dec 80 REPORT DATE- Dec 81 PAGINATION- 313p REPORT NO.- WYLEC-901-0012-A
CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 81/78
NTIS Prices- PC A14/MF A01

The purpose of the Type II Truck Test Program was to obtain performance data on several Type II (or premium) freight car trucks in order to characterize their operational behavior. Data were acquired in the performance regimes of curve negotiation, lateral stability, trackability, and ride quality. Tests were also conducted to obtain rolling resistance data as part of the fuel consumption study. Data on the Longitudinal coupler forces were used to compare the relative ability of various trucks to reduce rolling resistance and flanging forces, thus improving fuel consumption. The test program was designed to provide direct comparison measurements, wherever possible, with the Type I Truck tested earlier in TDOP Phase II. Seven Type II trucks were tested over the same test zones used during Type I testing. This report documents the changes to the instrumentation and equipment developed for Type I testing which were made for testing Type II trucks. Descriptions of the testing of each truck are presented, as are the procedures for data acquisition and reduction. Additionally, the report contains five appendices: Wheelset Calibration Data, Bearing Adapter Calibration Data, Type II Truck Test Plan and Procedure, Data Reduction Equations, and Transducer Location Measurement Data. The performance data gathered during testing will be used to formulate performance specifications for Type II trucks.

TRUCK DESIGN OPTIMIZATION PROJECT. PHASE II: TYPE I TRUCK TEST RESULTS REPORT. PB82-152000/XPS

Gibson, D. W.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8209 DESCRIP. NOTE- Technical rept. Apr-Sep 80 REPORT DATE- Dec 81 PAGINATION- 267p CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 81/77 NTIS Prices- PC A12/MF A01

The purpose of the Type I truck test program was to obtain performance data on Type I or conventional three-piece freight car trucks to characterize their operational behavior. One carset of 100-ton ASF Ride Control trucks was used with the 100-ton open hopper test car in all the series of tests. This report documents the Type I truck field test program. It describes: (1) the development of the measurement systems, (2) tests conducted, (3) data acquired, (4) samples of the type of information which can be extracted from the data, and (5) test plans and test procedures used. Data was collected in the performance regimes of curving negotiation, lateral stability, trackability, and ride quality. Tests were also conducted to obtain rolling resistance as part of the fuel consumption study.

CURVING PERFORMANCE ANALYSIS OF FREIGHT CAR TRUCKS. PB82-142068/XPS

Young, R. Marcotte, P. P.

CORP. SOURCE- DSL Dynamic Sciences Ltd., St-Laurent (Quebec). JOURNAL VOL.- u8208 DESCRIP. NOTE- Final rept. Feb-Sep 81 REPORT DATE- Sep 81 PAGINATION- 170p REPORT NO.- 188-3 MNTR. AGNCY.- FRA/ORD 81/76, TDC/TP 3211E NTIS Prices- PC A08/MF A01

A mathematical model of steady-state curve negotiation was used to simulate experimental curving tests of one conventional and six new concept railway freight car trucks. The report describes the model parameters used to characterize the trucks and test conditions. The experimental results from the Truck Design Optimization Project (TDOP) Phase II tests are compared to the model

predictions of lateral wheel/rail forces and wheelset angles of attack. The model was also used to perform parameter sensitivity studies for each truck. The results from this work show that the model can predict trends in the steady-state curving of a number of freight car trucks for a range of operating conditions, and can be used to determine the influence of parameter variations on truck curving performance.

EVALUATION OF METHODS FOR MEASUREMENT OF LONGITUDINAL RAIL FORCE IN UNLOADED TRACK. PB82-141052/XPS

Barber, T. E. Gertler, R. C. Dean, F. E. Harrison, H. D.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8208 DESCRIP. NOTE- Interim rept. REPORT DATE- Sep 81 PAGINATION- 51p CONT. NO.- DOT-FR-9162 MNTR. AGNCY.- FRA/ORD 81/65 NTIS Prices- PC A04/MF A01

This evaluation of potential methods to measure the long-term variation of longitudinal rail force in unloaded track was conducted to identify a practical approach for application at the Facility for Accelerated Service Testing. Two measurement systems based upon strain gage bridge technology were selected and mounted on a short segment of rail, which was subjected to axial and eccentric mechanical loading and uniform and nonuniform thermal loading. While both systems were found to be capable of meeting the measurement requirements, one is recommended for ease of installation, data processing, and calibration. The system consists of a 4-arm bridge circuit of weldable strain gages, with individual gages mounted longitudinally and vertically on either side of the rail web at the neutral axis. This system was shown to be independent of rail bending and temperature effects within the requirements of the system.

LIGHTWEIGHT VEHICLE TRACK SHUNTING PB82-140807/XPS

Dyer, T. K.

CORP. SOURCE- Dyer (Thomas K.), Inc., Lexington, MA. JOURNAL VOL.- u8207 REPORT DATE- Apr 81 PAGINATION- 81p MNTR. AGNCY.- FRA/ORD 81/56 NTIS Prices- PC A05/MF A01

The report was written in response to a standing need for a brief summary overview of the safety and reliability problems, applicable government regulations, and current status of industry developments associated with the operation of Lightweight Vehicles (LWV's) over U.S. railroad signal systems. An effort has been made to treat the subject of track circuit shunting sensitivity in as concise a manner as practicable, consistent with the phenomena associated with rolling-wheel/rail-surface resistance of LWV operation. The text describes the highly variable factors involved within wheel/rail shunting sensitivity, describes the current technological development status, and presents recommendations for technological research. It is believed that this can serve as introductory material for development of a program plan for needed FRA research aimed at economical and viable solutions to provide the level of signal system operational safety required for U.S. LWV passenger operation. An Appendix has been included covering Reference Documents, Industry Developed Instruction Manuals, Contacts of recognized experts within the field, special AAR formulas, and related information.

CHICAGO INTERMODAL TERMINAL ROADWAY FEASIBILITY STUDY. PB82-133018/XPS

Davidson, W. A. Powills, M. A. Jr.

CORP. SOURCE- Barton-Aschman Associates, Inc., Evanston, IL. JOURNAL VOL.- u8207 DESCRIP. NOTE- Final rept. REPORT DATE- Apr 81 PAGINATION- 120p CONT. NO.- DOT-FR-8156 MNTR. AGNCY.- FRA/ORD 80/64 NTIS Prices- PC A06/MF A01

Since 1976, the growth in intermodal traffic in the United States has increased an average of 14 percent per year. This growth has placed an increasing strain upon the entire intermodal transportation system. In response to this

growth, the railroads have attempted to increase the capacity of their terminal facilities. They have continued to expand the proportion of total freight capacity that includes trailer-on-flatcar (TOFC) equipment, and have begun to increase the use of TOFC unit trains in order to provide a high level of efficient service. The industry is responding to growth with a number of technological innovations, including computerized information systems; the development of lighter, more fuel-efficient flatcars; and new methods for more efficient loading and unloading of trailers onto and off of the flatcar units. The purpose of this study was to investigate the feasibility of constructing a private truck roadway on unused or abandoned railroad rights-of-way to serve this growing volume of trailer traffic and to do so in such a way that significant benefits, particularly drayage cost savings, could be obtained if such a project was implemented.

RAILROAD YARD SIMULATION MODEL: DESCRIPTION AND COMPUTER PROGRAM USERS' MANUAL. PB82-138686/XPS

Wittig, L. E. Waldman, C. E. Bender, E. K.

CORP. SOURCE- Bolt Beranek and Newman, Inc., Cambridge, MA. JOURNAL VOL.- u8206 DESCRIP. NOTE- Final rept. Sep 78-Feb 81 REPORT DATE- Oct 81 PAGINATION- 88p REPORT NO.- BBN-4606 CONT. NO.- DOT-FR-8091 MNTR. AGNCY.- FRA/ORD 81/25.I NTIS Prices- PC A05/MF A01

This report is part of a larger study to identify potentially cost-effective advanced braking and coupling systems. The report describes a model for determining the cost savings in railroad yards that would result from the implementation of advanced braking and coupling systems. First, the operations of a hypothetical composite yard are explained in terms of logic diagrams. These diagrams are reduced to a set of equations, which, in turn, are incorporated into an interactive computer program. Flow diagrams for the program are included. Several example cases are presented that explain how the user determines which variables should be changed, show how he enters this information into the program, and finally, show how he executes the program.

ENGINEERING ANALYSIS OF STRESSES IN RAILROAD RAILS.
PB82-129610/XPS

Johns, T. G. Sampath, S. G. Bell, J. C. Davies, K. B.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8205 DESCRIP. NOTE- Final rept. Jan 77-Jun 81 REPORT DATE- Oct 81 PAGINATION- 397p REPORT NO.- BATT-G-6266-0100 CONT. NO.- DOT-TSC-1038 MNTR. AGNCY.- FRA/ORD 81/51, DOT-TSC-FRA 81-8 NTIS Prices- PC A17/MF A01

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 Transportation Systems Center (TSC), a part of this program is to predict the reliability of rail in track. A necessary requirement for development of these techniques is the ability to determine 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 provides a comprehensive description of stresses in rail required for predicting reliability of rail in track structures. Contained is a description of stresses encountered in cracked and uncracked railroad rails at midrail stations and bolted joints as computed using analytical techniques developed in this program.

PREDICTION OF FATIGUE CRACK GROWTH IN RAIL STEELS.
PB82-129602/XPS

Broek, D. Rice, R. C.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8205 DESCRIP. NOTE- Final rept. Jul 75-Jul 77 REPORT DATE- Oct 81 PAGINATION- 147p CONT. NO.- DOT-TSC-1076-2 MNTR. AGNCY.- FRA/ORD 81/31, DOT-TSC-FRA 80-30 NTIS Prices- PC A07/MF A01

Measures to prevent derailments due to fatigue failures of rails require adequate knowledge of the rate of propagation of fatigue cracks under service loading. The report presents

a computational model for the prediction of crack growth in rails. The model was derived on the basis of experiments of crack growth under service simulation loading. The applications of the model are discussed. Material data on fatigue crack growth in rail steels are required for the execution of the predictive model. Such data were generated during the present program, but reported elsewhere.

FATIGUE CRACK GROWTH PROPERTIES OF RAIL STEELS.
PB82-129594/XPS

Broek, D. Rice, R. C.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8205 DESCRIP. NOTE- Final rept. Jul 75-Jul 77 REPORT DATE- Oct 81 PAGINATION- 160p CONT. NO.- DOT-TSC-1076-1 MNTR. AGNCY.- FRA/ORD 81/30, DOT-TSC-FRA 80-29 NTIS Prices- PC A08/MF A01

Fatigue crack propagation properties of rail steels were determined experimentally. The investigation covered 66 rail steels. The effects of the following parameters were studied: stress ratio (ratio of minimum to maximum stress in a cycle), frequency, temperature and orientation. The results were presented on the basis of the stress intensity factor. The threshold value of the stress intensity was determined. An equation correlating the crack growth rate and the stress intensity factor was established. A limited number of mixed mode crack growth tests were conducted. Also the behavior of surface flaws was studied. The results serve as a data base for a failure model presented in DOT-TSC-FRA-80-30/FRA/ORD-81/31.

CYCLIC INELASTIC DEFORMATION AND FATIGUE RESISTANCE OF A RAIL STEEL: EXPERIMENTAL RESULTS AND MATHEMATICAL MODELS.
PB82-129586/XPS

Leis, B. N. Laflen, J. H.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8205 DESCRIP. NOTE- Rept. for Jul 75-Jun 77 REPORT DATE- Oct 81 PAGINATION- 60p CONT. NO.- DOT-TSC-1076-3 MNTR. AGNCY.- FRA/ORD 81/29, DOT-TSC-FRA 80-28 NTIS Prices- PC A04/MF A01

Experimental results developed from tests of uniaxial, smooth specimens obtained from the head of an unused section of rail have been reported. Testing encompassed a broad range of conditions - monotonic tension, monotonic compression, and fully reversed constant-amplitude strain cycling. Additionally, a study of 'history effects' was made. Included in this study were tests to examine the influence of orientation, mean stress, initial prestrain, and periodic overstrain (both the cyclic deformation response and the fatigue resistance being reported for each condition). Results obtained from the above tests were used to develop mathematical models for rail deformation response and failure. Particular attention has been paid to the influence of stress state on deformation response and fatigue resistance.

EASTERN EUROPEAN TRACK STRUCTURE TECHNOLOGY AND RESEARCH.
PB82-128455/XPS

CORP. SOURCE- Kearney (A.T.), Inc., Alexandria, VA. JOURNAL VOL.- u8205 DESCRIP. NOTE- Final rept. REPORT DATE- Jul 81 PAGINATION- 138p CONT. NO.- DOT-FR-9051 MNTR. AGNCY.- FRA/ORD 81-58 NTIS Prices- PC A07/MF A01

Cooperative agreements between the United States and the Eastern European countries of Poland, Hungary and Rumania provide for the exchange of technical research and operational railroad information. To obtain on site, as well as published information on topics of specific interest to the Federal Railroad Administration (FRA), a United States delegation visited the railroad research laboratories, spoke with railroad experts, and explored the railroad operational systems of these three countries. Initial evaluation of the

numerous reports and observations resulting from this trip revealed that the information obtained was of interest not only to the FRA, but the U.S. railroad industry. Five major topics are discussed: Descriptions of Railroad Systems and Research Programs, Ballast Research, Lateral Resistance, Buckling of Track, and Tie practices are presented, followed by the current U.S. practices.

SINGLE AXLE AND ARTICULATED-SUPPORTING TRUCK.
PB82-128406/XPS

Kenworthy, M. A.

CORP. SOURCE- ENSCO, Inc., Springfield, VA. JOURNAL VOL.- u8204 DESCRIP. NOTE- Test results rept. REPORT DATE- Aug 81 PAGINATION- 60p CONT. NO.- DTFR53-80-C-00002 MNTR. AGNCY.- FRA/ORD 81/59, DOT-FR 81-17 NTIS Prices- PC A04/MF A01

This report presents the results of a project designed to quantify the service performance characteristics of two types of trucks. The first truck treated is essentially a conventional three-piece freight car truck-supporting the articulated connector of a multi-unit prototype intermodal railcar. This truck is referred to as the articulated supporting truck. The second truck investigated is a single axle truck. This truck, as its designation indicates, is a truck with one axle which is capable of yaw with respect to the carbody independent (within physical limits) of the other truck on the same unit. The test methodology is presented in detail including discussions of trucks, instrumentation, test zones, and test matrix. The results are presented and discussed in terms of the wheel/rail force vector (lateral-vertical), angle-of-attack, hunting critical speed, and ride quality. From these observations no intrinsic problems were discovered which would preclude these trucks from further consideration as rail service equipment.

RAILROAD CLASSIFICATION YARD TECHNOLOGY MANUAL. VOLUME II: YARD COMPUTER SYSTEMS. PB82-126806/XPS

Savage, N. P. Tuan, P. L. Gill, L. C. Ellis, H. T. Wong, P. J.

CORP. SOURCE- SRI International, Menlo Park, CA. JOURNAL VOL.- u8204 DESCRIP. NOTE- Final rept. REPORT DATE- Aug 81 PAGINATION- 126p CONT. NO.- DOT-TSC-1337 PROJ. NO.- SRI-6364 MNTR. AGNCY.- FRA/ORD 81/20.II NTIS Prices- PC A07/MF A01

This volume (Volume II) of the Railroad Classification Yard Technology Manual documents the railroad classification yard computer systems methodology. The subjects covered are: functional description of process control and inventory computer systems, development of computer system requirements, economic analysis, and computer systems acquisition, installation, and management. Volume I concerns the physical design of railroad classification yards.

RAIL VEHICLE DYNAMICS MODEL VALIDATION. PB82-116922/XPS

Shladover, S. E. Hull, R. L.

CORP. SOURCE- Systems Control, Inc., Palo Alto, CA. JOURNAL VOL.- u8204 DESCRIP. NOTE- Final rept. Sep 79-Jan 81 REPORT DATE- Aug 81 PAGINATION- 42p CONT. NO.- DOT-FR-9050 MNTR. AGNCY.- FRA/ORD 81/52 NTIS Prices- PC A03/MF A01

The validation of mathematical models of rail vehicle dynamics using test data poses a number of difficult problems, which are addressed in this report. Previous attempts to validate rail vehicle models are reviewed critically, and experience gained in validating dynamic models of aircraft and marine vehicles using system identification methods is then applied to the formulation of a general procedure for validating rail vehicle dynamic models. The procedure is outlined, step by step, for application with existing test data and for use as part of a new model validation test program. An example of the application of the initial stages of the procedure is demonstrated using data from the Perturbed Track Tests (PTT) at Pueblo to validate a simple linear model of the forced

vertical dynamics of a six-axle locomotive. Recommendations are offered for the conduct of future model validation efforts.

TRUCK DESIGN OPTIMIZATION PROJECT (TDOP) PHASE II: PERFORMANCE SPECIFICATION FOR TYPE II FREIGHT CAR TRUCKS. PB82-118647/XPS

RamaChandran, P. V. ElMadany, M. M.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8203 DESCRIP. NOTE- Technical rept. Jan 79-Jul 81 REPORT DATE- Aug 81 PAGINATION- 121p REPORT NO.- WR-81-28 CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 81/36-I NTIS Prices- PC A06/MF A01

One of the important goals of the Truck Design Optimization Project (TDOP) Phase II is to provide the railroad industry with a basis for performance specifications for the new generation (Type II) freight car trucks. This report sets forth such a quantitative basis as supported by available field test data. The quantified performance characterizations and recommended quidelines specifications have been arrived at through field testing several representative Type II trucks, reducing and analyzing the field test data, and interpreting them in the light of physical reasoning. The performance characteristics and guideline specifications are provided in four distinct regimes of performance including lateral stability, trackability, steady-state curve negotiation, and ride quality.

PROCEEDINGS OF THE WORKSHOP (2ND) FOR RAILROAD CLASSIFICATION YARD TECHNOLOGY HELD AT ST. LOUIS MISSOURI ON MAY 6 AND 7 1981. PB82-114398/XPS

Witt, E. S.

CORP. SOURCE- Pacific Consultants, Boston, MA. JOURNAL VOL.- u8203 DESCRIP. NOTE- Final rept. REPORT DATE- Jul 81 PAGINATION- 144p REPORT NO.- PC-DOT-05 CONT. NO.- DTFR80-C-00136 MNTR. AGNCY.- FRA/ORD 81/41 NTIS Prices- PC A07/MF A01

Topics of the two research sessions include: Yard technology - Yard design research, Noise control for yards, Measurement of rollability, New concepts in car speed control, Computer design case study, Car presence detection, velocity data acquisition package, Innovative concepts for next generation yards.

RAILROAD CLASSIFICATION YARD TECHNOLOGY. COMPUTER SYSTEM METHODOLOGY: CASE STUDY...POTOMAC YARD. PB82-114257/XPS

Savage, N. P. Hackworth, M. A. Tuan, P. L. Wong, P. J.

CORP. SOURCE- SRI International, Menlo Park, CA. JOURNAL VOL.- u8203 DESCRIP. NOTE- Final rept. REPORT DATE- Aug 81 PAGINATION- 78p CONT. NO.- DOT-FR-9082 PROJ. NO.- SRI-8497 MNTR. AGNCY.- FRA/ORD 81/61 NTIS Prices- PC A05/MF A01

This report documents the application of the railroad classification yard computer system methodology to Potomac Yard of the Richmond, Fredericksburg, and Potomac Railroad Company (RF&P). This case study entailed evaluation of the yard traffic capacity, development of computer systems requirements, analysis of alternative hardware configurations, assessment of benefits from upgrading the computer systems, and recommendations for system implementation and installation.

FREIGHT CAR DYNAMICS. PB82-116948/XPS

Law, E. H. Cooperrider, N. K.

CORP. SOURCE- Clemson Univ., SC. Dept. of Mechanical Engineering. JOURNAL VOL.- u8202 DESCRIP. NOTE- Final rept. REPORT DATE- Aug 81 PAGINATION- 52p CONT. NO.- DOT-OS-40018 MNTR. AGNCY.- FRA/ORD 81/47 NTIS Prices- PC A04/MF A01

The objective of this research project was to develop techniques to analyze the lateral dynamic behavior of railroad freight cars. The effort included development and correlation of theoretical techniques for predicting freight car dynamic behavior, and use of the techniques to investigate the behavior of present and proposed designs. The project was sponsored by FRA with support and cooperation from the Association of American Railroads and the Union Pacific Railroad. A number of models and analysis approaches were developed for freight car behavior on tangent track. These models differ widely in complexity. An output of the project is the understanding of the appropriate use of each model and analysis technique. Extensive field tests were planned and carried out with the cooperation and support of the Association of American Railroads (AAR), the Union Pacific Railroad (UP), and Martin Denver Division. These tests were conducted by the AAR and UP. Eight different vehicle configurations were tested, each at several speeds on both tangent and curved track. Data obtained from these tests were used for comparisons with theoretical predictions of vehicle response.

FREIGHT CAR DYNAMICS: FIELD TEST RESULTS AND COMPARISON WITH THEORY PB82-116930/XPS

Cooperrider, N. K. Law, E. H. Fries, R. H.

CORP. SOURCE- Clemson Univ., SC. Dept. of Mechanical Engineering. JOURNAL VOL.- u8202 REPORT DATE- Jun 81 PAGINATION- 142p CONT. NO.- DOT-OS-40018 MNTR. AGNCY.- FRA/ORD 81/46 NTIS Prices- PC A07/MF A01

Field tests of a conventional rail freight car were conducted to provide data for comparison with theoretical analyses of rail freight car dynamic behavior. These tests,

carried out by the Association of American Railroads and the Union Pacific Railroad, were designed to provide experimental information concerning modal damping, modal frequencies, mode shapes, motion amplitudes, critical hunting speeds, wheel-rail forces, and creep coefficients for comparison with theoretical results. Alternative techniques for theoretical freight car analysis, data processing, and comparison of theory and experiment are discussed. The 80-ton openhopper test car parameters, the wheel-rail and roadbed geometry, the test conduct and the data analysis precedures are described. Field test results in the form of time series data, RMS values, modal frequency and damping characteristics, and spectral analysis results are presented and discussed. Comparisons of test results with theoretical results of linear eigenvalue analyses, quasi-linear random response analyses, and hybrid computer simulations are given.

INTERMODAL FREIGHT TERMINAL SIMULATOR: REQUIREMENTS DEFINITION. PB81-247652/XPS

Shladover, S. E. Wilkie, K. A.

CORP. SOURCE- Systems Control, Inc., Palo Alto, CA. JOURNAL VOL.- u8126 DESCRIP. NOTE- Final rept. Mar 80-Jan 81 REPORT DATE- Jun 81 PAGINATION- 43p CONT. NO.- DOT-FR-9050 MNTR. AGNCY.- FRA/ORD 81/19 NTIS Prices- PC A03/MF A01

This report presents the results of a study of the potential applicability of an intermodal freight terminal simulator (IFTS) and a definition of the requirements for such a simulator. The IFTS is conceived as a simulation of an intermodal truck-rail terminal which includes a computer, a visual display of terminal status and a human operator to make terminal operating decisions. The computer generates traffic and anomalies, as well as recording results and calculating statistics, while the 'man in the loop' makes decisions in much the same way he would in a full-scale terminal. The display could be a physical model of a terminal or a computer graphics display. The IFTS could be used for improving the design and operating procedures of existing terminals, designing new terminals, training terminal operators, and demonstrating terminal problems to railroad people not directly involved with intermodal operations. Based on these expected uses, the report defines the characteristics the IFTS should have, including key

input and output quantities, the ability to replicate terminal operations, convenience of use, flexibility and reasonable cost. A plan for developing the IFTS is suggested, and the resources required are estimated. The principal simulator design issues which must be addressed before development can proceed are indicated, and the most important simulator design trade-offs are discussed.

ALTERNATE FUELS IN MEDIUM-SPEED DIESEL ENGINES: OFF-SPECIFICATION DIESEL FUELS SIMULATED COAL-DERIVED FUEL AND METHANOL. PB81-242562/XPS

Baker, Q. A. Storement, J. O.

CORP. SOURCE- Southwest Research Inst., San Antonio, TX. Dept. of Engine and Vehicle Research. JOURNAL VOL.- u8126 DESCRIP. NOTE- Research rept. no. 1 REPORT DATE- Jan 81 PAGINATION- 155p CONT. NO.- DOE-EM-78-C-4266 PROJ. NO.- SwRI-11-5361 MNTR. AGNCY.- FRA/ORD 80/40.I NTIS Prices- PC A08/MF A01

This report encompasses the first year of research activity of a multi-year research, development, and demonstration effort to investigate the use of alternate fuels in medium-speed diesel engines. Tests were performed on a laboratory two-cylinder medium-speed diesel engine in an attempt to define its ability to operate on alternate fuels and to define the performance and emission characteristics of the engine under such operation.

DUAL DISC/TREAD BRAKING AND REDUCED PRESSURE BRAKING EVALUATION PROGRAMS. PB81-231649/XPS

Frankowski, D. Scofield, R.

CORP. SOURCE- ENSCO, Inc., Alexandria, VA. Rail Transportation Engineering Div. JOURNAL VOL.- u8125
DESCRIP. NOTE- Test Results Report REPORT DATE- Mar 81
PAGINATION- 308p REPORT NO.- ENSCO-DOT-FR-80-22 CONT. NO.- DOT-FR-64113 MNTR. AGNCY.- FRA/ORD 81/22 AVAIL. NOTE- Sponsored in part by AMTRAK, Washington, DC. NTIS Prices- PC A14/MF A01

This report is the Test Results Report for the Dual Disc/Tread Brake Test. Data logs and records associated with this test are published separately in the Test Events Report Dual Disc/Tread Braking and Reduced Pressure Braking Evaluation Programs, Report No. FRA/ORD-81/21. The Dual Disc/Tread Braking Test was conducted to investigate the benefits of using dual systems on the Amcoach. The test evaluated candidate systems developed by Knorr-Bremse, New York Air Brake and Westinghouse Air Brake Company. The test showed that as presently configured, the Amcoach may often exceed the available adhesion and tend to experience momentary wheel sliding which causes spalling. The test indicated that the dual brake system may help to improve tread life and extend the capacity without over heating either the wheel tread or the disc. In addition to the single car cutaway test of the dual brake system and a normal Amcoach braking system, a special reduced pressure test was performed on the Amcoach. The results showed that reducing the full-service braking pressure may be an alternative way of reducing the adhesion demand at the lower speed to relieve the wheel sliding problem. This approach extends the stopping distance by only a small amount but does not provide a mechanism for maintaining the wheel/tread surface or increasing the overall system capacity as does the dual brake system.

RAILROAD ENERGY MANAGEMENT--TRAIN PERFORMANCE CALCULATOR: A SURVEY AND ASSESSMENT. PB81-234353/XPS

Howard, S. M. Gill, L. C. Wong, P. J.

CORP. SOURCE- SRI International, Menlo Park, CA. · JOURNAL VOL.- u8124 DESCRIP. NOTE- Final rept. REPORT DATE- Apr 81 PAGINATION- 72p CONT. NO.- DOT-FR-9082 MNTR. AGNCY.- FRA/ORD 81-02 NTIS Prices- PC A04/MF A01

This report presents a survey and assessment of train performance calculators (TPC) and train operations simulators (TOS). The purpose of the report is to increase the railroad industry's awareness of the present state of development, usefulness, and availability of these models.

AMTRAK FUEL CONSUMPTION STUDY. PB81-227332/XPS

Hitz, J. S.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA. JOURNAL VOL.- u8123 DESCRIP. NOTE- Final rept. May-Sep 80 REPORT DATE- Feb 81 PAGINATION- 77p REPORT NO.- DOT-TSC-FRA-81-6 MNTR. AGNCY.- FRA/ORD 81/42 NTIS Prices- PC A05/MF A01

This report documents a study of fuel consumption on National Railroad Passenger Corporation (Amtrak) trains and is part of an effort to determine effective ways of conserving fuel on the Amtrak system. The study was performed by the Transportation Systems Center (TSC) under the sponsorship of the Federal Railroad Administration and in cooperation with Amtrak. A series of 26 test runs were conducted on Amtrak trains operating between Boston, Massachusetts, and New Haven, Connecticut, to measure fuel consumption, trip time and other fuel-use-related parameters. The test data were analyzed and compared with results of the TSC Train Performance Simulator replicating the same operations. Results of the tests showed that the average fuel consumption for the 157.7 mile trip was 368 gallons and that the average fuel use efficiency was 277 ton-miles per gallon. Fuel consumption and fuel use efficiency were found to increase consistently with increasing train tonnage. One locomotive was also found to consume about 12 percent more fuel than the other locomotive

tested. The fuel consumption and trip time results for individual runs varied between +8.0 to -9.5 and +5.4 and -10.7 percent, respectively, of the Train Performance Simulator results. However, when averaged over the ten test runs analyzed, the fuel consumption and trip time results were within 1.04 and 0.03 percent, respectively, of the simulator. Throttle notch settings and train speed profiles also agreed well with simulated results.

BRAKE SYSTEM DESIGN OPTIMIZATION VOLUME II: SUPPLEMENTAL DATA. PB81-214702/XPS

Eshelman, L. L. Shelleman, C. C. Henderson, J. P.

CORP. SOURCE- Kearney (A.T.), Inc., Chicago, IL. JOURNAL VOL.- u8121 DESCRIP. NOTE- Final rept. Apr 77-Mar 78 REPORT DATE- Apr 81 PAGINATION- 156p CONT. NO.- DOT-TSC-1040-2 MNTR. AGNCY.- DOT-TSC-FRA 78-1, FRA/ORD 78/20 NTIS Prices- PC A08/MF A01

A detailed description of the functional performance of each freight car air brake system component is provided. This is followed by a discussion of the operation, performance, and design of air brake systems. The results of a survey made to estimate the population of brake system components in service, and present operating problems with these components is presented. In addition, the problems which require immediate solutions from the perspective of the railroad industry are tabulated. A summary of recent research work performed to investigate freight car wheel thermal capacity is presented.

LIGHTWEIGHT INTERMODAL FLATCAR EVALUATION PROGRAM. VOLUME II. TEST RESULTS REPORT (INCLUDING APPENDIX A - TRANSDUCER LOCATIONS). PB81-212706/XPS

Kentworthy, M. A. Edelman, J.

CORP. SOURCE- ENSCO, Inc., Alexandria, VA. Rail Transportation Engineering Div. JOURNAL VOL.- u8121
DESCRIP. NOTE- Technical rept. REPORT DATE- Dec 79
PAGINATION- 142p REPORT NO.- ENSCO-DOT-FR-79-24-VOL-2
CONT. NO.- DOT-FR-64113 MNTR. AGNCY.- FRA/ORD 80/07.II
NTIS Prices- PC A07/MF A01

The Lightweight Flatcar (LWFC) Evaluation Program was conducted to provide a comparative evaluation of the dynamic performance of two prototype skelton or lightweight flatcars with a conventional TTAX flatcar. For this purpose, measurements of the acceleration response of the entire vehicle system (axle, carbody, trailer, and container) were made under both controlled and revenue-service conditions. The controlled tests were conducted at zero (nominal), 50,000 and 125,000 accumulated miles of service. The results indicate that in terms of dynamic performance the lightweight flatcars were comparable overall to the conventional TTAX flatcar. This conclusion, however, must be evaluated for each special application, since situations were observed in which one flatcar was markedly superior to the other in performance.

LIGHTWEIGHT INTERMODAL FLATCAR EVALUATION PROGRAM. VOLUME I. MODAL ANALYSIS OF RAILCARS AN EXPLANATION AND APPLICATIONS GUIDE. PB81-212698/XPS

Kenworthy, M. A. Smith, J. I.

CORP. SOURCE- ENSCO, Inc., Alexandria, VA. Rail Transportation Engineering Div. JOURNAL VOL.- u8121
DESCRIP. NOTE- Technical rept. REPORT DATE- Dec 79
PAGINATION- 200p REPORT NO.- ENSCO-DOT-FR-79-24-VOL-1
CONT. NO.- DOT-FR-64113 MNTR. AGNCY.- FRA/ORD 80/07.I
NTIS Prices- PC A09/MF A01

This report describes a methodology referred to as modal analysis which can be a very useful tool in the study of the dynamic behavior of any elastic or rigid body. The concepts

of the technique are defined and illustrated with the use of a relatively simple one dimensional uniform beam. Following this, the general case is formulated and the procedure for its application is summarized. Next, practical considerations are discussed including both the analytical treatment, and the instrumentation and test design. The discussion of modal analysis concludes with the presentation of a program which used the methodology discussed in the report to make a comparative evaluation of two distinctly different rail vehicles. Conclusions are drawn and recommendations for future work are included.

ENERGY AUDIT OF THE BOSTON AND MAINE RAILROAD.
PB81-211765/XPS

Hitz, J. Dorer, R. Cultrera, S. Bohnwagner, A.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA.
JOURNAL VOL.- u8121 DESCRIP. NOTE- Interim rept. Jan 80-Feb 81 REPORT DATE- Apr 81 PAGINATION- 98p
REPORT NO.- DOT-TSC-FRA-81-11 MNTR. AGNCY.- FRA/ORD 81/43
NTIS Prices- PC A05/MF A01

This report documents an energy audit of the Boston and Maine Railroad performed in support of a joint Government/industry program to determine means of conserving energy on railroads without reducing safety or service quality. Phase I of the energy audit involved acquisition and analysis of energy-related data for the month of December 1979 to determine energy supply and use patterns on the B&M and identify major areas of energy use for conservation emphasis. Phase II involved more detailed analysis of additional diesel fuel data for the months of December 1979 through August 1980 to assist in identifying and evaluating conservation options for freight train operations.

WIND TUNNEL TESTS OF TRAILER AND CONTAINER MODELS. DETERMINATION OF THE INDEPENDENT INFLUENCE OF HEIGHT AND GAP SPACINGS AND TRAILER UNDERCARRIAGE SHIELDING ON AERODYNAMIC FORCES OCCURRING DURING RAILROAD TRANSPORT.
PB81-210734/XPS

Hammitt, A. G.

CORP. SOURCE- Hammitt (Andrew G.) Associates, Rancho Palos Verdes, CA. JOURNAL VOL.- u8121 DESCRIP. NOTE- Final rept. Sep 79-Mar 80 REPORT DATE- Mar 80 PAGINATION- 92p REPORT NO.- AGH-12-101-80 CONT. NO.- DOT-FR-8058 MNTR. AGNCY.- FRA/ORD 80/51 NTIS Prices- PC A05/MF A01

A series of wind tunnel tests have been run on scale model trains of 40 ft. containers and trailers. The models were 1/43 scale. A train of five models was used with forces and moments measured on the center model. A variety of spaces were used between the models. The height of the container models was varied and the undercarriage of the trailers was protected with shields of different heights. These tests are the latest in a series designed to determine the aerodynamic forces on containers and trailers on flatcars. This series provides additional information on the effect of different container block height and gap spacings and the effect of spacing on the forces on trailers with different amounts of shielding up to large values of yaw angle.

CONSTANT WARNING TIME CONCEPT DEVELOPMENT FOR MOTORIST WARNING AT GRADE CROSSINGS. PB81-205684/XPS

Monroe, R. L. Munsell, D. K. Rudd, T. J.

CORP. SOURCE- Systems Technology Lab., Inc., Arlington, VA. JOURNAL VOL.- u8120 DESCRIP. NOTE- Final rept. REPORT DATE- May 81 PAGINATION- 193p CONT. NO.- DOT-FRA-8042 MNTR. AGNCY.- FRA/ORD 81/07 NTIS Prices- PC A09/MF A01

One important improvement for achieving greater effectiveness in train-activated warning systems at railroad-highway grade crossings (RHGC) would be to provide a constant warning time (CWT) to the motorist of the impending arrival of a train. This report describes an investigation that was carried out to identify, evaluate and demonstrate the feasibility of concepts upon which a general

purpose CWT system could be developed. The scope of the study includes train detection, signal transmission, and associated logic, but did not include motorist warning devices. Primary emphasis was placed on the development of CWT concepts rather than equipment for such systems. Train detection techniques with the greatest potential for application to CWT systems are described and evaluated. These include seismic, magnetic, and acoustic transducers; doppler, guided and two dimensional radars, video sensors, strain gages, and proximity switches. The most promising of these are shown to be based on magnetic and acoustic concepts. Field tests carried out to demonstrate the feasibility of these techniques are described and the data is analyzed.

A METALLURGICAL ANALYSIS OF AN ASTM A212-B STEEL TANK CAR HEAD PLATE. PB81-205098/XPS

Early, J. G.

CORP. SOURCE- National Bureau of Standards, Washington, DC. JOURNAL VOL.- u8120 DESCRIP. NOTE- Final rept. REPORT DATE- Apr 81 PAGINATION- 53p REPORT NO.- NBSIR-78-1582 CONT. NO.- DOT-AR-40008 MNTR. AGNCY.- FRA/ORD 81/32 NTIS Prices- PC A04/MF A01

The sample was taken from the A-head plate of tank car SOEX 3033 involved in an accident near Winder, Georgia. The A-head plate was reportedly produced to specification ASTM A212-65, Grade B steel. The results of laboratory check chemical analyses indicated that the plate sample met the chemical requirements of ASTM A212-65, Grade B steel. The results of ambient-temperature bend tests and tensile tests showed that the plate sample satisfied both the bend requirements and the tensile elongation requirements but failed to meet the minimum ultimate tensile strength and yield point requirements of ASTM A212-65, Grade B steel. The results of metallographic analyses revealed substantial variation in the microstructure in the plate thickness direction. The observed coarse prior austenite grain size and large ferrite grain size is consistent with the coarse-grain steelmaking practice allowed for ASTM A212 steel and a high finishing temperature during fabrication. Hardness measurements of the microstructure correlated well with the measured tensile strength properties. The nil-ductility transition temperature was determined to be 30 F, a value equal to the highest value reported for a group

of tank car plate samples, including both accident samples and current and previously allowed tank car plate materials. The results of Charpy V-notch tests established that the 15 ft-lb energy absorption and 50% shear fracture appearance transition temperatures measured for both longitudinal and transverse specimens were all above 60 F and within normal tank car service temperature range. The high transition temperatures are related to both the coarse prior austenite grain size and large ferrite grain size observed in the microstructure and the steel chemistry.

RAILROAD CLASSIFICATION YARD TECHNOLOGY MANUAL. VOLUME I. YARD DESIGN METHODS. PB81-200560/XPS

Wong, P. J. Sakasita, M. Stock, W. A. Elliott, C. V. Hackworth, M. A.

CORP. SOURCE- SRI International, Menlo Park, CA. JOURNAL VOL.- u8119 DESCRIP. NOTE- Final rept. REPORT DATE- Mar 81 PAGINATION- 272p REPORT NO.- SRI-6364 CONT. NO.- DOT-TSC-1337 MNTR. AGNCY.- FRA/ORD 81/20.I NTIS Prices- PC A12/MF A01

This volume documents the procedures and methods associated with the design of railroad classification yards. Subjects include: site location, economic analysis, yard capacity analysis, design of flat yards, overall configuration of hump yards, hump yard track and switch layout, hump profile design, and hump trim-end design.

RESISTANCE OF A FREIGHT TRAIN TO FORWARD MOTION. VOLUME IV. USERS' MANUAL FOR FREIGHT TRAIN FUEL CONSUMPTION PROGRAM. PB81-199564/XPS

Muhlenberg, J. D.

CORP. SOURCE- MITRE Corp., McLean, VA. JOURNAL VOL.- u8119 h8101 DESCRIP. NOTE- Final rept. Feb 79-Jul 80 REPORT DATE- Feb 81 PAGINATION- 62p REPORT NO.- MTR-80W00127 CONT. NO.- DOT-FR-54090 MNTR. AGNCY.- FRA/DF 81/021A, FRA/ORD 78/04.IV NTIS Prices- PC A04/MF A01

This document provides information concerning a computer program devised to predict fuel consumption of a freight train operated over a track with known characteristics. The information is of value to both the user who wants merely to utilize the capabilities of the program and the programmers who need to understand its inner workings. The program is listed in its entirety in the document.

RAILROAD ELECTROMAGNETIC COMPATIBILITY (EMC): PROCEEDINGS OF A SYMPOSIUM SPONSORED BY THE RAILROAD EMC WORKING GROUP--ASSOCIATION OF AMERICAN RAILROADS INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AMERICAN RAILWAY ENGINEERING ASSOCIATION HELD AT UNIVERSITY OF SOUTHERN COLORADO PUEBLO ON MAY 14-15 1980. PB81-199333/XPS

Elliott, P.

CORP. SOURCE- Unified Industries, Inc., Springfield, VA. JOURNAL VOL.- u8119 DESCRIP. NOTE- Final rept. REPORT DATE- Jan 81 PAGINATION- 220p CONT. NO.- DOT-FR-9044 MNTR. AGNCY.- FRA/ORD 80/46 NTIS Prices- PC A10/MF A01

The Symposium on Railroad Electromagnetic Compatibility (May 14-15, 1980) consisted of five technical sessions on electric traction power distribution systems, locomotive and other propulsion systems, communication and power lines paralleling the right-of-way, signal and control, and measurement techniques; a special session giving an overview of the Transportation Test Center; and a special session on the activities of the Railroad Electromagnetic Compatibility Working Group.

EVALUATION OF SIGNAL/CONTROL SYSTEM EQUIPMENT AND TECHNOLOGY. TASK 6: SPECIFICATION DEVELOPMENT. PB81-194318/XPS

Taylor, S. F. Marshall, J. F. Hallmark, W. C. Whalen, R. B.

CORP. SOURCE- STV, Inc., Pottstown, PA. JOURNAL VOL.- u8119 DESCRIP. NOTE- Rept. for Oct 77-Jan 81 REPORT DATE- Jan 81 PAGINATION- 123p CONT. NO.- DOT-FR-773-4236 MNTR. AGNCY.- FRA/ORD 78/39.6 NTIS Prices- PC A06/MF A01

Development of a signal/control system for high speed 255 Km/h (160 MPH) train operation must proceed in a logical sequence. One step is a comparison of alternative candidate systems representing state-of-the-art technology. This report presents a functional specification with which to measure the utility of selected candidates. Requirements are organized to permit growth from basic cab signaling to total monitoring and control from a single point. A functional path has been taken in order to provide the widest latitude in hardware design.

THE NON-STEADY OUTFLOW OF PROPANE VAPOR FROM A RAILROAD TANK CAR. PB81-200594/XPS

Sallet, D. W. Palmer, M. E.

CORP. SOURCE- Maryland Univ., College Park. Dept. of Mechanical Engineering. JOURNAL VOL.- u8118 DESCRIP. NOTE- Final rept. Aug 75-Mar 80 REPORT DATE- Apr 81 PAGINATION- 32p CONT. NO.- DOT-FR-64181 MNTR. AGNCY.- FRA/ORD 80/61 NTIS Prices- PC A03/MF A01

This report discusses the venting of vapors from rail tank cars. Two particular problem areas are addressed, namely the non-steady character of the flow in the final blow-down stage and the influence of real gas effects on flow predictions. Equations are developed with which the non-steady mass flow rate, the stagnation temperature and pressure drop and the mass left in the tank as a function of time can be predicted for vapor flow out of a finite-sized tank. The influence on the predicted flow rates due to the use of different equations of state (e.g. perfect gas

equation, van der Waal's equation, Starling's equation) is shown and discussed. Example calculations are carried out for propane. The developed equations and calculation methods are valid for most other vapors and gases of industrial fluids commonly shipped in rail tank cars.

RAILROAD CLASSIFICATION YARD TECHNOLOGY: NOISE CONTROL. PB81-199739/XPS

Stusnick, E. Montroll, M. Kohli, V.

CORP. SOURCE- Wyle Labs./Wyle Research, Arlington, VA. JOURNAL VOL.- u8118 DESCRIP. NOTE- Final rept. Jul 80-Mar 81 REPORT DATE- Mar 81 PAGINATION- 41p CONT. NO.- DOT-TSC-1786 MNTR. AGNCY.- FRA/ORD 81/18 NTIS Prices- PC A03/MF A01

This report provides the railroad yard designer with a basic understanding of the principles involved in controlling noise, either in the design of new yards or in revisions to existing yards. The material presented allows the designer to better understand information contained in more advanced noise control writings should he undertake detailed noise control designs or elect to interact with acoustic experts in the development of such designs. The report contains discussions of sound fundamentals, measurement and analysis instrumentation, measurement procedures, current regulations, railroad noise sources and noise control methods.

DUAL-MODE LOCOMOTIVE SYSTEMS ENGINEERING. VOLUME 2: DETAILED DESCRIPTION AND ANALYSIS. PB81-191322/XPS

Lawson, L. J. Cook, L. M.

CORP. SOURCE- Garrett Corp., Torrance, CA. AiResearch Mfg. Div. JOURNAL VOL.- u8118 DESCRIP. NOTE- Final rept. Dec 79-Nov 80 REPORT DATE- Feb 81 PAGINATION- 201p REPORT NO.- 80-17253-2 CONT. NO.- DTFR53-80-C-00010 MNTR. AGNCY.- FRA/ORD 80/82.II NTIS Prices- PC A10/MF A01

This report, Volume II, provides a detailed description of the analysis of the dual mode locomotive (DML) systems

engineering study undertaken as Phase I of a proposed five-phase program. The intent of the overall DML program is the development, in-service demonstration, and ultimate deployment of dual-mode locomotives. This study has confirmed the technical viability of the DML based on a modified diesel-electronic locomotive model SD40-2, which can operate from either a high voltage catenary electrified at 60 Hz or from an onboard diesel engine. The DML can be made available in either 50- or 25-kv versions and could have a regenerative electric brake capability if required. The weight of a 50-kv, regenerative DML (the heaviest option) is under 398,000 lb, with normal options included. The space requirements for the electric components are compatible with installation on existing locomotive platforms without interfering with the diesel power equipment.

DUAL-MODE LOCOMOTIVE SYSTEMS ENGINEERING. VOLUME 1: SUMMARY.
PB81-191314/XPS

Lawson, L. J. Cook, L. M.

CORP. SOURCE- Garrett Corp., Torrance, CA. AiResearch Mfg. Div. JOURNAL VOL.- u8118 DESCRIP. NOTE- Final rept. Dec 79-Nov 80 REPORT DATE- Feb 81 PAGINATION- 93p
REPORT NO.- 80-17253-1 CONT. NO.- DTFR53-80-C-00010
MNTR. AGNCY.- FRA/ORD 80/82.I NTIS Prices- PC A05/MF A01

This report, Volume I, provides a summary of the systems engineering study under taken as Phase I of a proposed five-phase program. The intent of the overall program is the development, in-service demonstration, and ultimate deployment of dual-mode locomotives. This study has confirmed the technical viability of the dual-mode locomotive (DML) based on a modified model SD40-2, which can operate from either a high voltage catenary electrified at 60 Hz or from an onboard diesel engine. The DML is available in both 50- and 25-kv versions and can have a regenerative electric brake capability if required. The weight of a 50-kv, regenerative DML (the heaviest option) is under 398,000 lb, with normal options included. The space requirements for the electric components are compatible with installation on existing locomotive platforms without interfering with the diesel power equipment. The cost of the conversion of an SD40-2 to the DML configuration at locomotive rebuild is up to $414,097.

RESISTANCE OF A FREIGHT TRAIN TO FORWARD MOTION - VOLUME III ECONOMIC ANALYSIS AND CORRELATION OF PREDICTIONS WITH FIELD DATA. PB81-191017/XPS

Muhlenberg, J. D.

CORP. SOURCE- MITRE Corp., McLean, VA. JOURNAL VOL.- u8118 DESCRIP. NOTE- Final rept. Feb 79-Jul 80 REPORT DATE- Feb 81 PAGINATION- 152p MNTR. AGNCY.- FRA/ORD 78/04.III NTIS Prices- PC A08/MF A01

This final report is a supplement to two earlier FRA reports on train resistance and its impact upon fuel consumption. The portion of this effort reported was partly directed toward detailed correlation of predictions of fuel consumption from simulated runs with actual field measurement. In addition, computer simulations were made in an effort to corroborate some theoretical curves set forth in Volume II and other places in the literature. The economics of fuel savings effected through the use of light weight hopper cars in unit coal train service are examined in great detail, and various types of economic models which might be used to evaluate such savings and considerations concerning the proper selection of one of them are discussed in an appendix. Consideration is given to future investigations and conclusions are drawn. A second appendix explains the improvements made to the computer program since the version reported in Volume II and the modifications to the calculating routine to optimize the efficiency of the program and minimize operating time.

FUNDAMENTAL STUDIES RELATED TO WHEEL-RAIL CONTACT STRESS. PB81-194300/XPS

Paul, B.

CORP. SOURCE- Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics. JOURNAL VOL.- u8117 DESCRIP. NOTE- Final rept. Jul 76-Sep 80 REPORT DATE- Jan 81 PAGINATION- 35p CONT. NO.- DOT-OS-60144 MNTR. AGNCY.- FRA/ORD 81/05 NTIS Prices- PC A03/MF A01

This Final Report summarizes the research performed and provides a brief review of the major results of the program.

The problems discussed include: the development of cost-effective methods for finding the wheel-rail contact patch, finding subsurface internal stresses, determining points where plastic flow will first occur, finding the distribution of surface shear stresses on the contact patch, finding the boundary between slip and adhesion on the contact patch, and finding the relationship between applied forces and wheel-rail creepage. This work will be useful in explaining, and devising means of preventing various forms of stress-induced rail and wheel failures, as well as a whole complex of problems related to wheel-rail guidance and tractive forces. In particular, the dynamic behavior of rail vehicles can be analyzed relative to the forces developed at the rail-wheel interface.

RAILROAD CONSTRUCTION YARD TECHNOLOGY: EVALUATION OF APPROACHES TO CAR PRESENCE DETECTION. PB81-193286/XPS

Wilson, D. S. Peterson, N. J.

CORP. SOURCE- Shaker Research Corp., Ballston Lake, NY. JOURNAL VOL.- u8117 DESCRIP. NOTE- Final rept. Oct 78-Mar 81 REPORT DATE- Mar 81 PAGINATION- 72p CONT. NO.- DOT/FRA-8199 MNTR. AGNCY.- FRA/ORD 81/01 NTIS Prices- PC A04/MF A01

The techniques utilized to detect the presence of railroad cars in Railroad Classification Yards are discussed. The report addresses application requirements, performance characteristics, life characteristics and failure modes for commonly used detector types. A study is presented on alternate techniques for detecting railroad cars, including field and laboratory evaluations. A Specification Guide defining the requirements for presence detectors, for use by the railroad industry, is appended to the report.

RAILROAD ELECTROMAGNETIC COMPATIBILITY: LOCOMOTIVE - VOLUME 3. SUMMARY OF AEM-7 ELECTROMAGNETIC EMISSION MEASUREMENTS. PB81-184343/XPS

O'Neill, D. J.

CORP. SOURCE- Electromagnetic Compatibility Analysis Center, Annapolis, MD. JOURNAL VOL.- u8117 DESCRIP. NOTE- Interim rept. REPORT DATE- Feb 81 PAGINATION- 178p
REPORT NO.- ECAC-CR-80-132 CONT. NO.- DOT-AR-74311
MNTR. AGNCY.- FRA/ORD 80/66.3 NTIS Prices- PC A09/MF A01

Results of electromagnetic emission measurements performed on an AEM-7 at the Transportation Test Center near Pueblo, Colorado, are presented. A brief description of the measurements and methodology employed is included.

REVIEW AND SUMMARY OF COMPUTER PROGRAMS FOR RAILWAY VEHICLE DYNAMICS. PB81-183857/XPS

Pilkey, W. D.

CORP. SOURCE- Virginia Univ., Charlottesville. School of Engineering and Applied Science. JOURNAL VOL.- u8117
DESCRIP. NOTE- Final rept. REPORT DATE- Feb 81
PAGINATION- 127p REPORT NO.- UVA-529162-MAE80-101
CONT. NO.- DOT-FR-8076 MNTR. AGNCY.- FRA/ORD 81/17
NTIS Prices- PC A07/MF A01

To assess the state of development of computer programs which apply to the dynamics of rail vehicles, reviews were prepared of programs in six different categories: lateral stability, curving dynamics, wheel/rail contact, freight vehicle dynamics, analog hybrid simulation, and train dynamics. In addition, a number of European programs were summarized. A survey of users of the programs was also undertaken. The great majority of available programs are not widely used; some were developed for specific purposes and are not suitable for general use. The three programs which are most frequently applied are Train Operations Simulator (TOS), Quasi-Static Lateral Stability Model (QSLTS), and Nonlinear Flexible Car Body Vehicle Model (FVEH). These codes appear to be the best choices for further improvement and verification. Other areas in which users believe computer programs could be profitably employed are wear,

fatigue, fracture, inelastic behavior, and impact. The principal drawback in applying existing codes seems to be the difficulty in obtaining accurate input data, such as damping constants, moments of inertia, stiffnesses, and locations of mass centers.

RAILROAD CAR COUPLING SHOCK VERTICAL MOTION AND ROLLER BEARING TEMPERATURE. PB81-183469/XPS

Peacock, T. V. Richmond, J. A.

CORP. SOURCE- Naval Surface Weapons Center White Oak Lab., Silver Spring, MD. JOURNAL VOL.- u8117 DESCRIP. NOTE- Final rept. Jul-Aug 76 REPORT DATE- Jan 81 PAGINATION- 84p REPORT NO.- NSWCWOLTN-10592 CONT. NO.- DOT/TSC-RA-76-42-613-0032 MNTR. AGNCY.- DOT-TSC-FRA 81-4, FRA/ORD 81/13 NTIS Prices- PC A05/MF A01

Data were collected in a study of railroad car operating environment. Measurements were made on wheel bearing operating temperatures, coupling impact shock, and vertical motion of the car due to rail travel. Tests were conducted using an instrumented consist at the Transportation Test Center (TTC) at Pueblo, CO. in July and August 1976.

A METALLURGICAL EVALUATION OF TWO AAR M128 STEEL TANK CAR HEAD PLATES USED IN SWITCHYARD IMPACT TESTS. PB81-179483/XPS

Early, J. G. Interrante, C. G.

CORP. SOURCE- National Bureau of Standards, Washington, DC. National Measurement Lab. JOURNAL VOL.- u8117 DESCRIP. NOTE- Rept. no. 10 (Final) REPORT DATE- May 80 PAGINATION- 67p REPORT NO.- NBSIR-80-2039 NTIS Prices- PC A04/MF A01

This metallurgical evaluation included determining whether the samples conformed with the appropriate specifications and to determine the impact test behavior of both plate samples.

NONDESTRUCTIVE TECHNIQUES FOR MEASURING THE LONGITUDINAL FORCE IN RAILS PROCEEDINGS OF A JOINT GOVERNMENT-INDUSTRY CONFERENCE HELD IN WASHINGTON DC. ON FEBRUARY 26-27 1979. PB81-179368/XPS

Elliott, P.

CORP. SOURCE- Unified Industries, Inc., Alexandria, VA. JOURNAL VOL.- u8116 DESCRIP. NOTE- Final rept. REPORT DATE- Dec 79 PAGINATION- 191p CONT. NO.- DOT-FR-8046, DOT-FR-9044 MNTR. AGNCY.- FRA/ORD 80/50 NTIS Prices- PC A09/MF A01

The Conference on Nondestructive Techniques for Measuring the Longitudinal Force in Rails consisted of an introductory session followed by three major sessions on ultrasonic techniques, Barkhausen and sonic techniques, and X-ray diffraction techniques. This report is made up of the technical papers presented at the conference, together with the edited transcripts of the panel discussions and question-and-answer periods held at the end of each major session.

TEST TRAIN PROGRAM ELEVENTH ANNUAL REPORT. PB81-177420/XPS

CORP. SOURCE- ENSCO, Inc., Alexandria, VA. Rail Transportation Engineering Div. JOURNAL VOL.- u8115 DESCRIP. NOTE- Progress rept. 1 Jul 78-30 Jun 79. REPORT DATE- Jan 81 PAGINATION- 148p REPORT NO.- ENSCO-DOT-FR-80-20 CONT. NO.- DOT-FR-64113 MNTR. AGNCY.- FRA/ORD 80/78 NTIS Prices- PC A07/MF A01

The report describes progress on the Engineering and Test Support Services for Railroad Instrumentation, Data Acquisition, Processing and Evaluation Program from 1 July 1978 through 30 June 1979. This report covers operation and maintenance of the FRA track-geometry-measurement and data acquisition fleet. It also covers track survey operations and dynamic tests on lightweight flatcars, Rohr Turboliners, Amcoach brakes, Metroliners, perturbed track testing of locomotives, track stiffness, DODX railcars and LRC cant deficiency. A description of the Wayside Detection Facility is included as well as descriptions of various improvements to the survey cars and their measurement equipment.

LOW-PROFILE LIGHT-WEIGHT INTERMODAL RAILCAR. VOLUME II: ACCEPTANCE TEST PLAN. PB81-167934/XPS

Hull, R. L. Shladover, S. E.

CORP. SOURCE- Systems Control, Inc., Palo Alto, CA.
JOURNAL VOL.- u8115 DESCRIP. NOTE- Final rept. Feb-Dec 80. REPORT DATE- Feb 81 PAGINATION- 25p CONT. NO.- DOT-FR-9050 MNTR. AGNCY.- FRA/ORD 81/04.II NTIS Prices- PC A02/MF A01

The Performance Specification and Acceptance Test Plan, respectively contained in Volumes I and II of this report, define the requirements for a low-profile, light-weight intermodal railcar. The Car specified here must be able to operate within restricted clearances when carrying either highway trailers or standard shipping containers and must be designed for low aerodynamic resistance and light weight in order to conserve energy. Also, it must be capable of dynamically stable operation at the high speeds which may be expected in special inter-modal unit trains. Both safety and protection of lading against the damage which can be caused by excessive ride vibration must be considered in the design of the Car. It is intended that these requirements will stimulate the development of innovative railcar designs. The Acceptance Test Plan includes not only the performance tests which must be performed to verify compliance with the Specification, but also the sequence of preliminary and detailed analyses which should be performed to facilitate development of a Car design which will meet the performance requirements.

TRUCK DESIGN OPTIMIZATION PROJECT (TDOP) PHASE II. PERFORMANCE CHARACTERIZATION OF TYPE I FREIGHT CAR TRUCKS. PB81-172157/XPS

RamaChandran, P. V. ElMadany, M. M.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8114 DESCRIP. NOTE- Technical rept. Oct 79-Jan 81 REPORT DATE- Jan 81 PAGINATION- 77p REPORT NO.- TDOPTR-10 CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 81/10 NTIS Prices- PC A05/MF A01

TDOP/Phase II is part of a series of studies being conducted by the FRA to define the engineering options available to the railroad industry to improve the efficiency and productivity of rail freight operations. As part of this effort, experimental and analytic studies have been conducted to define the performance capabilities of the current freight car truck configurations. The results of these studies are used in arriving at quantitative characterization of performance of the standard, three-piece freight car truck under revenue service conditions. Field test data generated during TDOP/Phase I were supplemented with additional data gathered from field tests conducted during Phase II. These test data were reduced, analyzed, and interpreted in the light of physical reasoning as well as analytic simulations. Overall truck performance has been classified into four distinct and non-overlapping regimes, namely lateral stability, trackability, steady state curve negotiation, and ride quality. Performance indices, or measureable quantities typical of each performance regime, have been defined and quantified through the use of field test data and analytic simulations. Correlating the quantified performance indices within each regime with representative operating conditions such as speed, lading, and track quality, ranges of quantified performance levels have been arrived at as being characteristic of truck performance under the corresponding conditions of operation.

LOW-PROFILE LIGHT-WEIGHT INTERMODAL RAILCAR. VOLUME III: REQUIREMENTS DEFINITION. PB81-171548/XPS

CORP. SOURCE- Kearney (A.T.), Inc., Alexandria, VA. JOURNAL VOL.- u8114 DESCRIP. NOTE- Final rept. May 78-Feb 81. REPORT DATE- Feb 81 PAGINATION- 254p CONT. NO.- DOT-FR-8075 MNTR. AGNCY.- FRA/ORD 81/04.III NTIS Prices- PC A12/MF A01

A major constraint limiting the growth of TOFC service in the Northeast has been one of railroad clearance restrictions along the Northeast Corridor. Presently, tunnel clearances at Washington, DC., Baltimore, and New York restrict TOFC train movements using standard TTX-type railcars loaded with standard sized highway trailers. The design of a low profile intermodal car would increase operating efficiency and expand the TOFC market for the railroads by improving the car's payload-to-weight ratio, reducing its aerodynamic drag, and eliminating the need for circuitous routings. Shippers could benefit from the new car through increased service, reduced drayage expenses, reduced transit times, and greater schedule reliability. Reductions in road congestion, road repair costs, air and noise pollution, combined with increases in employment and local tax contributions resulting from industrial growth would significantly serve the public interest. In response to these needs, the Congress directed the Federal Railroad Administration to sponsor the design, construction, and testing of a prototype intermodal railcar. This report documents the results of the project to develop the requirements definition for the design of the railcar, the primary output of which was a Preliminary Performance Specification.

RAILROAD ELECTROMAGNETIC COMPATIBILITY LOCOMOTIVE VOLUME 2 SUMMARY OF E-60 CP ROAD TEST ELECTROMAGNETIC EMISSION MEASUREMENTS. PB81-165466/XPS

O'Neill, D. J.

CORP. SOURCE- Electromagnetic Compatibility Analysis Center, Annapolis, MD. JOURNAL VOL.- u8114 DESCRIP. NOTE- Interim rept. REPORT DATE- Jan 81 PAGINATION- 57p REPORT NO.- ECAC-CR-80-73 MNTR. AGNCY.- FRA/ORD 80/66.II NTIS Prices- PC A04/MF A01

Results of electromagnetic emission measurements performed on an E-60 locomotive during a revenue service run from Washington, DC, to New Haven, Connecticut, and back are presented. A description of the measurements and methodology employed is included.

RAIL PASSENGER VEHICLE TRUCK DESIGN METHODOLOGY. PB81-165383/XPS

Wormley, D. Hedrick, K. Horak, D. Bell, C.

CORP. SOURCE- Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering. JOURNAL VOL.- u8113 DESCRIP. NOTE- Final rept. Dec 78-Nov 79 REPORT DATE- Jan 81 PAGINATION- 190p REPORT NO.- DOT-TSC-FRA-81-1 CONT. NO.- DOT-TSC-1471 MNTR. AGNCY.- FRA/ORD 81/11 NTIS Prices- PC A09/MF A01

A procedure for the selection of rail passenger truck design parameters to meet dynamic performance indices has been developed. The procedure is based upon partitioning the design task into three tradeoff studies: (1) a vertical ride quality-secondary stroke trade-off, (2) a lateral ride quality-second stroke trade-off, and (3) a stability curving trade-off. The procedure is illustrated with the selection of design parameters for an intercity 130-mph vehicle and an urban 80-mph vehicle.

LOW-PROFILE LIGHT-WEIGHT INTERMODAL RAILCAR. VOLUME I: PERFORMANCE SPECIFICATION. PB81-163685/XPS

Shladover, S. E. Hull, R. L.

CORP. SOURCE- Systems Control, Inc., Palo Alto, CA.
JOURNAL VOL.- u8113 DESCRIP. NOTE- Final rept. Feb-Dec 80
REPORT DATE- Feb 81 PAGINATION- 25p CONT. NO.-
DOT-FR-9050 MNTR. AGNCY.- FRA/ORD 81/04.I NTIS Prices-
PC A02/MF A01

The Performance Specification and Acceptance Test Plan, respectively contained in Volumes I and II of this report, define the requirements for a low-profile, light-weight intermodal railcar. The car specified here must be able to operate within restricted clearances when carrying either highway trailers or standard shipping containers and must be designed for low aerodynamic resistance and light weight in order to conserve energy. Also, it must be capable of dynamically stable operation at the high speeds which may be expected in special intermodal unit trains. Both safety and protection of lading against the damage which can be caused by excessive ride vibration must be considered in the design of the car. It is intended that these requirements will stimulate the development of innovative railcar designs. The car specified here is an idealized concept which satisfies the most stringent technological requirements presently envisioned for intermodal service. The performance baseline defined here may not be equally appropriate for all users of the specification, some of whom may wish to modify some of the requirements better to reflect their particular needs. The acceptance test plan includes not only the performance tests which must be performed to verify compliance with the specification, but also the sequence of preliminary and detailed analyses which should be performed to facilitate development of a car design which will meet the performance requirements.

RAILROAD CLASSIFICATION YARD TECHNOLOGY--ASSESSMENT OF CAR SPEED CONTROL SYSTEMS. PB81-161556/XPS

Kiang, R. L. Ploeger, D. W. Stock, W. A. Eckerle, J. Wong, P. J.

CORP. SOURCE- SRI International, Menlo Park, CA. JOURNAL VOL.- u8113 DESCRIP. NOTE- Final rept. Jul 78-Jun 80 REPORT DATE- Dec 80 PAGINATION- 105p CONT. NO.- DOT-FR-8084 PROJ. NO.- SRI-7663 MNTR. AGNCY.- FRA/ORD 80/90 NTIS Prices- PC A06/MF A01

The scope of this study has encompassed an evaluation of fourteen yard speed control devices, an identification of four generic speed control systems, a qualitative assessment of the four systems, and finally a quantitative analysis of three hypothetic yards each employing a system that is considered promising. These three systems are (1) the advanced clasp retarder system, (2) the quasi-continuous control system, and (3) a hybrid system incorporating quasi-continuous control. No ranking of these three systems is possible because each has its advantages and disadvantages; and one system may be more suitable than the others under a particular circumstance....

GRADE CROSSING ACCIDENT INJURY MINIMIZATION STUDY.
PB81-155236/XPS

Frey, E. J. Teobald, C. E. Jr.

CORP. SOURCE- HH Aerospace Design Co., Inc., Bedford, MA.
JOURNAL VOL.- u8113 DESCRIP. NOTE- Final rept. REPORT DATE- Dec 80 PAGINATION- 197p CONT. NO.- DOT-FR-8197
MNTR. AGNCY.- FRA/ORD 80/87 NTIS Prices- PC A09/MF A01

The purpose of this study was to identify and evaluate potential concepts for reducing injuries to highway occupants and train occupants in rail-highway grade crossing collisions. A review of railroad, highway vehicle, and aviation sources was made. The identified concepts were principally those from railroad crashworthiness and collision attenuation studies, plus some collision attenuation concepts from highway safety work. A list of concepts was developed and each approach evaluated for effectiveness according to a set of criteria based primarily on performance in normal operations and in accidents. The more effective concepts consisted of a hard-faced deflector covering the locomotive coupler to remove the highway vehicle from the tracks, a soft crushable collision attenuator to reduce impact accelerations and forces, and increased use of rail brakes in passenger cars.

IMPROVING RAILROAD TECHNOLOGY. A DIRECTORY OF RESEARCH AND DEVELOPMENT PROJECTS OF THE FEDERAL RAILROAD ADMINISTRATION.
PB81-172231/XPS

CORP. SOURCE- Transportation Systems Center, Cambridge, MA.
JOURNAL VOL.- u8112 REPORT DATE- 1980 PAGINATION- 193p
MNTR. AGNCY.- FRA/ORD 81/14 NTIS Prices- PC A09/MF A01

The FRA's Research and Development program has as its goals near-term improvements in products and processes which would enhance safety, improvements in the economic viability and efficiency of the Nation's railroad operations, and reduction of adverse environmental effects of railroad operations. The Office of Research and Development has

responsibility for three major programs: (1) Track, Equipment and Personnel Safety, (2) Railroad Operational Improvements, and (3) Improved Passenger Systems. The Track, Equipment, and Personnel Safety Program is aimed at redueing the number and severity of railroad-related accidents. The Railroad Operational Improvement Program is aimed at improving freight classification and switching yards, promoting the exchange of technology and information between railroad companies, improving intermodal equipment, facilities and operations, and conserving energy. The Improved Passenger Systems Program is designed to emphasize train technology and subsystem development.

ASSESSMENT OF LOCOMOTIVE CREW IN-CAB OCCUPATIONAL NOISE EXPOSURE. PB81-154395/XPS

Kilmer, R. D.

CORP. SOURCE- National Bureau of Standards, Washington, DC. National Engineering Lab. JOURNAL VOL.- u8111 DESCRIP. NOTE- Final rept. REPORT DATE- Dec 80 PAGINATION- 185p MNTR. AGNCY.- FRA/ORD 80/91 NTIS Prices- PC A09/MF A01

The railroad industry, unlike most other U.S. industries, is not subject to the safety regulations of the Occupational Safety and Health Administration. Instead, railroad workers are covered by the safety regulations of the Federal Railroad Administration (FRA). This report documents an extensive study designed to assess the noise environment in locomotive cabs. Operational duty cycle and in-cab sound level data are presented for 18 test runs made on 16 different locomotives used in wide range of operational modes (e.g., through freight and local transfer freights), varies terrains (mountainous, undulating and flat) and varied trip lengths (6 to 12 hours). The general conclusion of this study is that there does not appear to be a widespread problem of overexposure to noise based on the same type of evaluation as currently used by OSHA (only 1 out of 18 test runs exceeded the criteria). The noise exposure is within acceptable limits because the operational duty cycle is such that the sources which generate high sound levels (horn and brake) are operating only for short periods of time and because the locomotive spends a great deal of time in idle (diesel engine sound levels below 90 dB). However, there was one test run for which an overexposure to noise was measured. To pinpoint such cases where overexposure to noise may occur, a simplified testing

procedure is developed. This test consists of making in-cab sound level measurements of engine notch 8 (no load), horn sounding and brake application with the locomotive stationary. With these three sound level measurements and an estimate of the time that the locomotive is operating on-line, the in-service noise dose can be estimated and a pass/fail assessment made of whether the noise exposure might exceed acceptable limits.

PROCEEDINGS OF THE WORKSHOP FOR CLASSIFICATION YARD TECHNOLOGY HELD IN CHICAGO ILLINOIS ON OCTOBER 30-31 1979. A STATUS REPORT ON YARD RESEARCH. PB81-143315/XPS

Witt, E. S. Sheldlock, N.

CORP. SOURCE- Pacific Consultants, Boston, MA. JOURNAL VOL.- u8110 DESCRIP. NOTE- Final rept. REPORT DATE- Dec 80 PAGINATION- 209p REPORT NO.- PC-DOT-01 CONT. NO.- DOT-FRA-9126 MNTR. AGNCY.- FRA/ORD 80/17 NTIS Prices- PC A10/MF A01

The Classification Yard Technology Workshop was sponsored by the Federal Railroad Administration (FRA) to present the results of current yard research under the Railroad Operational Improvements Program. The major program objectives are the development of technologies, quantification of areas for improvement, evaluation of components and systems, and improvement of effectiveness of railroad communication and control systems. These proceedings include the technical papers, responses to the workshop questionnaire, and comments of conference participants and panel members of the following areas of research: Yard Design Methods, New Concepts in Car Speed Control, Improvements for Car Presence Detection, Measurements of Rolling Resistance, Electromagnetic Compatibility, and Yard Computer Systems.

G-SENSING DERAILMENT DETECTOR. PB81-127466/XPS

Nance, P.

CORP. SOURCE- Naval Surface Weapons Center White Oak Lab., Silver Spring, MD. JOURNAL VOL.- u8108 DESCRIP. NOTE- Final rept. REPORT DATE- Oct 80 PAGINATION- 73p
CONT. NO.- DOT-AR-54162 MNTR. AGNCY.- FRA/ORD 80/75
NTIS Prices- PC A04/MF A01

This report describes procedures used to arrive at design concepts for a displacement sensitive derailment sensor. It summarizes and analyzes wheel and coupling shock and vibration data derived from over-the-road and derailment-field tests as well as data derived from computer simulations of the track environment and wheel fall from the track. Also described are physical tests of several computer-defined derailment sensor models. Based on the results of these tests, a prototype derailment sensor having an iron seismic mass which is part of a magnetic damping circuit was designed and tested in the laboratory and at the Transportation Test Center, Pueblo, Colorado. Two electronic signal processing methods are discussed which showed feasibility for monitoring seismic mass position and damping coil voltage and determining if the respective position or velocity criterion for derailment was met. Finally, a discussion and analysis of a possible means of using the rail car's vertical motion to produce electrical energy for recharging a battery to run low power signal processing circuits is presented.

THERMAL SENSING UNIT TEST FOR RAILROAD CAR JOURNAL BEARINGS. PB81-127458/XPS

Donley, M. E.

CORP. SOURCE- Naval Surface Weapons Center White Oak Lab., Silver Spring, MD. JOURNAL VOL.- u8108 DESCRIP. NOTE- Final rept. REPORT DATE- Oct 80 PAGINATION- 31p
REPORT NO.- NSWCWOLTN-10527 CONT. NO.- DOT-AR-54162
MNTR. AGNCY.- FRA/ORD 80/76 NTIS Prices- PC A03/MF A01

The test series included measuring the temperature of a railroad journal assembly during actual operation, reproducing field conditions in the laboratory for sensor

development testing, and testing the thermal sensor in actual use. Normal operating temperature, over-heated bearing temperatures, and several journal surface temperatures were measured during field operation. The data obtained was used in determining the subsequent laboratory test parameters. A hot plate temperature test was used for testing the sensor in the early stages of development. Existing laboratory facilities were modified to provide simulated field temperature inputs to a partial side frame and journal assembly for confirmation tests. Data from all field and laboratory tests is included.

TRACK RENEWAL SYSTEM AND WOOD TIE REUSE ANALYSIS.
PB81-125510/XPS

Cataldi, G. R. Elkaim, D. N.

CORP. SOURCE- Unified Industries, Inc., Springfield, VA.
JOURNAL VOL.- u8108 DESCRIP. NOTE- Final rept. Aug 79-Jul 80 REPORT DATE- Oct 80 PAGINATION- 100p CONT. NO.- DOT-FR-9044 MNTR. AGNCY.- FRA/ORD 80/63 NTIS Prices- PC A05/MF A01

The report presents the results of an analytical study of the technical and economic feasibility of applying the track renewal method of railroad track maintenance in the United States. The core of the report consists of a detailed framework for conducting a comparative economic analysis of the track renewal method versus the traditional selective maintenance method. The framework includes detailed descriptions of both methods, unit costs for each major operation under each method, and the comparative present worth long-term costs associated with each method. The report also presents a worldwide survey of present and future track renewal machine technology. Also included is a discussion of the use of track renewal machines for abandoning existing track, building new track, and for other nonmaintenance applications.

FRICTION SNUBBER FORCE MEASUREMENT SYSTEM COMPLETE TEST DATA. PB81-122822

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8108 REPORT DATE- Oct 79 PAGINATION- 6 mag tapes and documentation NTIS Prices- CP T07

SEE ABSTRACTS BELOW.

FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 11 AND 12. PB81-122814

Bakken, G. B. Bates, E. Gibson, D. W.

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8108 k8101 DESCRIP. NOTE- Data file REPORT DATE- Oct 79 PAGINATION- mag tape REPORT NO.- FRAORDMT-80726 MNTR. AGNCY.- FRA/DF 80/006 AVAIL. NOTE- Also available in set of 6 tapes PC T07, PB81-122822. Source tape is in ASCII and BINARY character sets. Character set restricts preparation to 9 track, one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-129596. NTIS Prices- CP T02

Twelve field test runs were performed to measure friction snubber forces using a device developed by Wyle Laboratories, Colorado Springs. Reel 6 contains test runs 011 and 012. Four devices were installed on a Type I truck (the ASF Ride Control) which was placed under the B-end of a loaded open hopper car. Forty-eight channels of data were acquired on friction snubber force, car speed, automatic location detection, acceleration, and displacement at critical points on the truck and carbody. The first test run was made over branchline class 2 track on the Blue Diamond Spur near Las Vegas, Nevada. The test zone included both tangent and curved jointed rail with an uphill grade of approximately 1.8%. The test run starts at 20 mph at milepost 5 and continues until milepost 7, where the speed starts decreasing down to 2 mph at the end of the test at milepost 8.2. The second test run was made over mainline class 4 track with a downhill grade of approximately 0.8%. The test run starts at 50 mph at milepost 322 and continues

until milepost 324.5, where the speed starts decreasing down to 5 mph at the end of the test at milepost 326.8. The significant test parameters associated with these two tests are: Car Type -100-ton open hopper; Car Orientation - B-end forward; Car Tare Weight - 57,900 pounds; Tare Weight 201,500 pounds; Type of Lading - gravel; Truck Center - 36 feet, 2 inches; No. of Loco's - 1; No. of Cars Fore - 2; No. of Cars Aft - 2; Truck Type - ASF Ride Control 70-ton; Wheel Base - 68 inches; Springs Group Out - 7 D5; Spring Group In - 6 D5; Center Plate Diameter - 14 inches; Center Plate Lub - Moly Disulfied; Side Bear B-End -Stucki double; Side Bear Clear - 0.25 inches; Snubber Type - constant; Snubber Springs - 2 ASF 3020.

FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 9 AND 10. PB81-122806

Bakken, G. B. Bates, E. Gibson, D. W.

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8108 k8101 DESCRIP. NOTE- Data file REPORT DATE- Oct 79 PAGINATION- mag tape REPORT NO.- FRAORDMT-80725 MNTR. AGNCY.- FRA/DF 80/005 AVAIL. NOTE- Also available in set of 6 tapes PC T07, PB81-122822. Source tape is in ASCII and BINARY character sets. Character set restricts preparation to 9 track, one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-129596. NTIS Prices- CP T02

Twelve field test runs were performed to measure friction snubber forces using a device developed by Wyle Laboratories, Colorado Springs. Reel 5 contains test runs 009 and 010. Four devices were installed on a Type I truck (the ASF Ride Control) which was placed under the B-end of a half-loaded, open hopper car. Forty-eight channels of data were acquired on friction snubber force, car speed, automatic location detection, acceleration, and displacement at critical points on the truck and carbody. The first test run was made over branchline class 2 track on the Blue Diamond Spur near Las Vegas, Nevada. The test zone included both tangent and curved jointed rail with an uphill grade of approximately 1.8%. The test run starts at 20 mph at milepost 5 and continues until milepost 7, where the speed starts decreasing down to 2 mph at the end of the test at milepost 8.2. The second test run was made over mainline

class 4 track with a downhill grade of approximately 0.8%. The test run starts at 50 mph at milepost 322 and continues until milepost 324.5, where the speed starts decreasing down to 5 mph at the end of the test at milepost 326.8. The significant test parameters associated with these two tests are: Car Type -100-ton open hopper; Car Orientation - B-end forward; Car Tare Weight - 57,900 pounds; Tare Weight 141,000 pounds; Type of Lading - gravel; Truck Center - 36 feet, 2 inches; No. of Loco's - 1; No. of Cars Fore - 2; No. of Cars Aft - 2; Truck Type - ASF Ride Control 70-ton; Wheel Base - 68 inches; Springs Group Out - 7 D5; Spring Group In - 6 D5; Center Plate Diameter - 14 inches; Center Plate Lub - Moly Disulfied; Side Bear B-End -Stucki double; Side Bear Clear - 0.25 inches; Snubber Type - constant; Snubber Springs - 2 ASF 3020.

FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 7 AND 8. PB81-122798

Bakken, G. B. Bates, E. Gibson, D. W.

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8108 k8101 DESCRIP. NOTE- Data file REPORT DATE- Oct 79 PAGINATION- mag tape REPORT NO.- FRAORDMT-80724 MNTR. AGNCY.- FRA/DF 80/004 AVAIL. NOTE- Also available in set of 6 tapes PC T07, PB81-122822. Source tape is in ASCII and BINARY character sets. Character set restricts preparation to 9 track, one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-129596. NTIS Prices- CP T02

Twelve field test runs were performed to measure friction snubber forces using a device developed by Wyle Laboratories, Colorado Springs. Reel 4 contains test runs 007 and 008. Four devices were installed on a Type I truck (the Barber S-2) which was placed under the B-end of a loaded open hopper car. Forty-eight channels of data were acquired on friction snubber force, car speed, automatic location detection, acceleration, and displacement at critical points on the truck and carbody. The first test run was made over branchline class 2 track on the Blue Diamond Spur near Las Vegas, Nevada. The test zone included both tangent and curved jointed rail with an uphill grade of approximately 1.8%. The test run starts at 20 mph at milepost 5 and continues until milepost 7, where the speed

starts decreasing down to 2 mph at the end of the test at milepost 8.2. The second test run was made over mainline class 4 track with a downhill grade of approximately 0.8%.. The test run starts at 50 mph at milepost 322 and continues until milepost 324.5, where the speed starts decreasing down to 5 mph at the end of the test at milepost 326.8. The significant test parameters associated with these two tests are: Car Type -100-ton open hopper; Car Orientation - B-end forward; Car Tare Weight - 57,900 pounds; Type of Lading - empty; Truck Center - 36 feet, 2 inches; No. of Loco's - 1; No. of Cars Fore - 2; No. of Cars Aft - 2; Truck Type - ASF Ride Control 70-ton; Wheel Base - 68 inches; Springs Group Out - 7 D5; Spring Group In - 6 D5; Center Plate Diameter - 14 inches; Center Plate Lub - Moly Disulfied; Side Bear B-End -Stucki double; Side Bear Clear - 0.25 inches; Snubber Type - constant Snubber Springs - 2 ASF 3020.

FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TESTS RUNS 5 AND 6. PB81-122780

Bakken, G. B. Bates, E. Gibson, D. W.

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8108 k8101 DESCRIP. NOTE- Data file REPORT DATE- Oct 79 PAGINATION- mag tape REPORT NO.- FRAORDMT-80723 MNTR. AGNCY.- FRA/DF 80/003 AVAIL. NOTE- Also available in set of 6 tapes PC T07, PB81-122822. Source tape is in ASCII and BINARY character sets. Character set restricts preparation to 9 track, one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-129596. NTIS Prices- CP T02

Twelve field test runs were performed to measure friction snubber forces using a device developed by Wyle Laboratories, Colorado Springs. Reel 3 contains test runs 005 and 006. Four devices were installed on a Type I truck (the Barber S-2) which was placed under the B-end of a loaded open hopper car. Forty-eight channels of data were acquired on friction snubber force, car speed, automatic location detection, acceleration, and displacement at critical points on the truck and carbody. The first test run was made over branchline class 2 track on the Blue Diamond Spur near Las Vegas, Nevada. The test zone included both tangent and curved jointed rail with an uphill grade of approximately 1.8%. The test run starts at 20 mph at

milepost 5 and continues until milepost 7, where the speed starts decreasing down to 2 mph at the end of the test at milepost 8.2. The second test run was made over mainline class 4 track with a downhill grade of approximately 0.8%. The test run starts at 50 mph at milepost 322 and continues until milepost 324.5, where the speed starts decreasing down to 5 mph at the end of the test at milepost 326.8. The significant test parameters associated with these two tests are: Car Type -100-ton open hopper; Car Orientation - B-end forward; Car Tare Weight - 63,600 pounds; Tare Weight 209,500 pounds; Type of Lading - empty; Truck Center - 40 feet, 6 inches; No. of Loco's - 1; No. of Cars Fore - 2; No. of Cars Aft - 2; Truck Type - Barber 70-ton; Wheel Base - 68 inches; Springs Group Out - 7 D5; Spring Group In - 4 D5; Stat Spring Comp - 11 inches; Center Plate Diameter - 14 inches; Center Plate Lub - Moly Disulfied; Side Bear B-End -Stucki double; Side Bear Clear - 0.23 inches; Snubber Type - load varying; Snubber Springs - 2 Barber B432.

FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 3 AND 4. PB81-122772

Bakken, G. B. Bates, E. Gibson, D. W.

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8108 k8101 DESCRIP. NOTE- Data file REPORT DATE- Oct 79 PAGINATION- mag tape REPORT NO.- FRAORDMT-80722 MNTR. AGNCY.- FRA/DF 80/002 AVAIL. NOTE- Also available in set of 6 tapes PC T07, PB81-122822. Source tape is in ASCII and BINARY character sets. Character set restricts preparation to 9 track, one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-129596. NTIS Prices- CP T02

Twelve field test runs were performed to measure friction snubber forces using a device developed by Wyle Laboratories, Colorado Springs. Reel 2 contains test runs 003 and 004. Four devices were installed on a Type I truck (the Barber S-2) which was placed under the B-end of a half-loaded, open hopper car. Forty-eight channels of data were acquired on friction snubber force, car speed, automatic location detection, acceleration, and displacement at critical points on the truck and carbody. The first test run was made over branchline class 2 track on the Blue Diamond Spur near Las Vegas, Nevada. The test zone included

both tangent and curved jointed rail with an uphill grade of approximately 1.8%. The test run starts at 20 mph at milepost 5 and continues until milepost 7, where the speed starts decreasing down to 2 mph at the end of the test at milepost 8.2. The second test run was made over mainline class 4 track with a downhill grade of approximately 0.8%. The test run starts at 50 mph at milepost 322 and continues until milepost 324.5, where the speed starts decreasing down to 5 mph at the end of the test at milepost 326.8. The significant test parameters associated with these two tests are: Car Type -100-ton open hopper; Car Orientation - B-end forward; Car Tare Weight - 63,600 pounds; Tare Weight 149,300 pounds; Type of Lading - gravel; Truck Center - 40 feet, 6 inches; No. of Loco's - 1; No. of Cars Fore - 2; No. of Cars Aft - 2; Truck Type - Barber 70-ton; Wheel Base - 68 inches; Springs Group Out - 7 D5; Spring Group In - 4 D5; Stat Spring Comp - 11 inches; Center Plate Diameter - 14 inches; Center Plate Lub - Moly Disulfied; Side Bear B-End -Stucki double; Side Bear Clear - 0.23 inches; Snubber Type - load varying; Snubber Springs - 2 Barber B432.

FRICTION SNUBBER FORCE MEASUREMENT SYSTEM. DATA TAPE TEST RUNS 1 AND 2. PB81-122764

Bakken, G. B. Bates, E. Gibson, D. W.

CORP. SOURCE- Federal Railroad Administration, Washington, DC. Office of Research and Development. JOURNAL VOL.- u8108 k8101 DESCRIP. NOTE- Data file REPORT DATE- Oct 79 PAGINATION- mag tape REPORT NO.- FRAORDMT-80721 MNTR. AGNCY.- FRA/DF 80/001 AVAIL. NOTE- Also available in set of 6 tapes PC T07, PB81-122822. Source tape is in ASCII and BINARY character sets. Character set restricts preparation to 9 track, one-half inch tape only. Identify recording mode by specifying density only. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-129596. NTIS Prices- CP T02

Twelve field test runs were performed to measure friction snubber forces using a device developed by Wyle Laboratories, Colorado Springs. Reel 1 contains test runs 001 and 002. Four devices were installed on a Type I truck (the Barber S-2) which was placed under the B-end of a empty open hopper car. Forty-eight channels of data were acquired on friction snubber force, car speed, automatic location detection, acceleration, and displacement at critical points on the truck and carbody. The first test run was made over

EVALUATION OF THE COSTS AND BENEFITS OF ADVANCED BRAKING AND COUPLING SYSTEMS. PB81-123556/XPS

Bender, E. K. Wittig, L. E. Wright, H. A.

CORP. SOURCE- Bolt Beranek and Newman, Inc., Cambridge, MA. JOURNAL VOL.- u8106 DESCRIP. NOTE- Final rept. Sep 78-Jun 80 REPORT DATE- Oct 80 PAGINATION- 69p REPORT NO.- BBN-4417 CONT. NO.- DOT-FR-8091 MNTR. AGNCY.- FRA/ORD 80/49 NTIS Prices- PC A04/MF A01

The report presents an evaluation of the costs and benefits of sixteen advanced railroad braking and coupling systems. Most of the benefits result from improved classification yard efficiencies, with secondary benefits accruing through reduced accident rates, road delays, and maintenance related to component wear and failure. The most promising systems are couplers with wide gathering ranges, a brake condition monitoring system, and a remote controlled brake locking system. In addition, ultrasonic brake control on cars presently requiring special handling and direct electronic brake control all show promise of improving railroad productivity.

RAILROAD ELECTROMAGNETIC COMPATIBILITY. LOCOMOTIVE VOLUME 1 SUMMARY OF E-60 CP ELECTROMAGNETIC EMISSION YARD MEASUREMENTS. PB81-117988/XPS

O'Neill, D. J.

CORP. SOURCE- Electromagnetic Compatibility Analysis Center, Annapolis, MD. JOURNAL VOL.- u8105 DESCRIP. NOTE- Interim rept. REPORT DATE- Oct 80 PAGINATION- 182p REPORT NO.- ECAC-CR-80-027 MNTR. AGNCY.- FRA/ORD 80/066.I NTIS Prices- PC A09/MF A01

Results of electromagnetic emission measurements performed on E-60 locomotives at AMTRAK's Wilmington, Delaware, Maintenance facility are presented. A description of the measurements and methodology employed is included.

OPERATIONAL PARAMETERS IN ACOUSTIC SIGNATURE INSPECTION OF RAILROAD WHEELS. PB81-116766/XPS

Dousis, D. Finch, R. D.

CORP. SOURCE- Houston Univ., TX. Dept. of Mechanical Engineering. JOURNAL VOL.- u8106 DESCRIP. NOTE- Final rept. Mar 76-Oct 78 REPORT DATE- Apr 80 PAGINATION- 296p CONT. NO.- DOT-TSC-1187 MNTR. AGNCY.- DOT-TSC-FRA 80-9, FRA/ORD 80/21 NTIS Prices- PC A13/MF A01

A brief summary is given of some prior studies which established the feasibility of using acoustic signatures for inspection of railroad wheels. The purpose of the present work was to elucidate operational parameters which would be of importance for the development of a prototype system. Experimental and theoretical investigations were conducted to obtain more information on the effects on wheel vibrations of geometrical variations, wear, internal stress etc. Hardware improvements and interfacing were carried out for a wayside installation, in addition to software development for real time data acquisition and processing. Field tests were made to evaluate system performance, to permit follow-up on certain wheels and to obtain tape recordings from a sample of axle sets in service. These tape recordings were used to optimize the data processing software and to attempt to correlate identifiable wheel conditions with characteristics of the acoustic signature. The greatest signature differences were obtained when one of a pair of wheels was cracked. Differential wear was found to be a major cause of differences in the signatures of good wheel pairs. It is claimed that the knowledge gained from this study is sufficient to warrant the installation of a prototype system with a reasonable likelihood of success. Another important finding is that the frequencies of certain resonant modes shift slightly with changes in residual stress.

PERFORMANCE OF A SINGLE-SIDED LINEAR INDUCTION MOTOR WITH SOLID BACK IRON AND WITH VARIOUS MISALIGNMENTS. VOLUME 1. PB81-119463/XPS

Kliman, G. B. Mischler, W. R. Oney, W. R.

CORP. SOURCE- General Electric Corporate Research and Development, Schanectady, NY. JOURNAL VOL.- u8105
DESCRIP. NOTE- Final rept. on Phase 2 15 Sep 75-15 May 78
REPORT DATE- Sep 80 PAGINATION- 102p REPORT NO.-
SRD-78-069 CONT. NO.- DOT-FR-64147 MNTR. AGNCY.-
FRA/ORD 80/53-1 NTIS Prices- PC A06/MF A01

A test facility was designed and built to measure all aspects of the performance of a single-sided high-speed linear induction motor with solid back iron over a wide range of frequency, speed, and excitation. The facility was equipped and instrumented to measure all the usual performance parameters plus all of the six-axis forces in normal operation and, when displaced, in the remaining five degrees of freedom (air gap, lateral, pitch, roll, and yaw). Performance in the normal position was compared to the mesh/matrix prediction. Generally good agreement was obtained between measured and predicted values of thrust and efficiency. Differences between predicted and measured thrust (especially at high slips) were related to the solid back iron and skin saturation. Agreement between predicted and measured normal forces was not satisfactory. The six-axis force measuring system was thoroughly analyzed to determine the range of validity of the measurements and the errors inherent in using a sector motor to simulate a flat linear motor.

COMPARISONS BETWEEN DESIGNS FOR SINGLE-SIDED LINEAR ELECTRIC MOTORS: HOMOPOLAR SYNCHRONOUS AND INDUCTION.
PB81-116188/XPS

Nondahl, T. A. Richter, E.

CORP. SOURCE- General Electric Co., Schenectady, NY.
JOURNAL VOL.- u8105 DESCRIP. NOTE- Final rept. on Phase 3 15 Sep 75-30 Jul 78 REPORT DATE- Sep 80 PAGINATION- 114p CONT. NO.- DOT-FR-64147 MNTR. AGNCY.- FRA/ORD 80/54 NTIS Prices- PC A06/MF A01

A design study of two types of single-sided (with a passive rail) linear electric machine designs, namely homopolar linear synchronous machines (LSM's) and linear induction machines (LIM's), is described. It is assumed the machines provide tractive effort for several types of light rail vehicles and locomotives. These vehicles are wheel supported and require tractive powers ranging from 200 kW to 3735 kW and top speeds ranging from 112 km/hr to 400 km/hr. All designs are made according to specified magnetic and thermal criteria. The LSM advantages are a higher power factor, much greater restoring forces for track misalignments, and less track heating. The LIM advantages are no need to synchronize the excitation frequency precisely to vehicle speed, simpler machine construction, and a more easily anchored track structure. The relative weights of the two machine types vary with excitation frequency and speed; low frequencies and low speeds favor the LSM. The effect of variations in several LSM design parameters are shown to illustrate trends in machine dimensions, track weight, and commutating reactance. The details of the LSM design programs are described and a Fortran IV listing of the programs is proveded.

DESIGN FABRICATION AND EVALUATION OF PROTOTYPE WAYSIDE BRAKE INSPECTION SENSORS. PB81-116105/XPS

Spaulding, D. B. Lentz, K. W. Jr.

CORP. SOURCE- Novatek, Inc., Burlington, MA. JOURNAL VOL.- u8105 DESCRIP. NOTE- Final rept. Dec 77-Aug 78 REPORT DATE- Jun 80 PAGINATION- 205p CONT. NO.- DOT-TSC-1323 MNTR. AGNCY.- DOT-TSC-FRA 80-8, FRA/ORD 80/20 NTIS Prices- PC A10/MF A01

Prototype Wayside instrumentation has been designed, developed, and tested that proves the feasibility of measuring braking system effectiveness on moving rail cars. The instrumentation system includes a specially designed short section of instrumented rail and two infrared detectors. The rail section deflects elastically under each passing wheel load, and two orthogonally placed transducers discriminate between rail reaction to braking and to weight. A pair of infrared detectors viewing the rims on both wheels of each axle provide thermal data useful in determining the side to side ratio of total axle braking effort. Together these sensors can generate data to evaluate the braking performance of each wheel. Field tests to evaluate the system were conducted on a commercial rail line and at the U.S. Department of Transportation's Transportation Test Center at Pueblo, CO. Test results showed that the sensors were able to indicate normal and abnormal braking conditions. Also included in the report are a railcar brake system fault and malfunction analysis, structural analysis of the instrumented rail, design analysis of the infrared sensor, detail specifications of the rail and infrared sensors, and recommendations for further system development and testing.

A REPORT ON INVESTIGATION INTO RAIL PASSENGER SAFETY.
PB81-116196/XPS

Mattison, P. D. Palmer, D. W. Nayak, P. R.

CORP. SOURCE- Little (Arthur D.), Inc., Cambridge, MA.
JOURNAL VOL.- u8104 DESCRIP. NOTE- Final rept. REPORT DATE- Oct 80 PAGINATION- 88p REPORT NO.- ADL-80589-30
CONT. NO.- DOT-FR-74261 MNTR. AGNCY.- FRA/ORD 80/65
NTIS Prices- PC A05/MF A01

Investigations are made into issues affecting rail passenger safety in intercity and commuter rail service. The objectives of the study were to identify important safety issues that need resolution, to describe the means for resolving these issues, and to describe further research that is critically needed. Special attention was given to those issues highlighted by the National Transportation Safety Board (NTSB) in recent recommendations. The important safety issues identified are briefly described as communications, train control systems, vehicle crashworthiness, vehicle interior design, emergency egress and lighting, equipment maintenance and inspection, and employee training.

PLATE INSTRUMENTED WHEELSETS FOR THE MEASUREMENT OF WHEEL/RAIL FORCES. PB81-116113/XPS

Thompson, W. I. III.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA.
JOURNAL VOL.- u8104 DESCRIP. NOTE- Final rept. May 78-79
REPORT DATE- Oct 80 PAGINATION- 66p REPORT NO.- DOT-TSC-FRA-80-58 MNTR. AGNCY.- FRA/ORD 80/58 NTIS Prices- PC A04/MF A01

Strain gauge instrumented wheelsets are an important research tool in experimental rail vehicle testing. This report expounds the principle of operation of the instrumented plate type of wheelset which is constructed by the scientifically exact application of strain gauges on the plate region of railroad wheels so that the wheelset is transformed into a sophisticated force transducer. An example of the application of the principles expounded is presented for a locomotive wheelset having wheels with

S-shaped plate regions and 40-in. (1016-mm) diameters. The corresponding measurement system that utilizes such instrumented wheelsets is synopsized. This information is useful to railroads and other research groups interested in measuring wheel/rail forces.

USER'S MANUAL FOR THE MAINTENANCE COST METHODOLOGY FOR HIGH SPEED PASSENGER TRAIN TRUCKS. PB81-115479/XPS

Smith, R. L. Krauter, A. I. Betor, J.

CORP. SOURCE- Shaker Research Corp., Ballston Lake, NY.
JOURNAL VOL.- u8104 DESCRIP. NOTE- Final rept. Oct 78-Feb 80 REPORT DATE- Sep 80 PAGINATION- 238p CONT. NO.- DOT-TSC-1619 MNTR. AGNCY.- DOT-TSC-FRA 80-21, FRA/ORD 80/70 NTIS Prices- PC A11/MF A01

This document is a user's manual for the simulation cost modeling (SCM) technique as applied to a passenger railcar truck and its component parts. The manual includes application of the technique through the development of an example maintenance schematic diagram, example truck component cost data, and example maintenance procedures. The computer program and its various operating modes are described with the aid of a full set of example data obtained from Amtrak personnel. A complete listing of the FORTRAN IV program and a set of example data for its operation are contained in the appendixes. A set of cost results for the example Amtrak data cover maintenance expenditures by maintenance actions and by component truck subassemblies. Also listed in the example results are a set of cost sensitivites related to the modeled maintenance system.

TRACK GEOMETRY MEASUREMENT SYSTEM. PB81-114563/XPS

Howerter, E. D.

CORP. SOURCE- ENSCO, Inc., Springfield, VA. Transportation and Instrumentation Sciences Div. JOURNAL VOL.- u8104 DESCRIP. NOTE- Final rept. Jun-Oct 78 REPORT DATE- Sep 80 PAGINATION- 99p REPORT NO.- 1196 CONT. NO.- DOT-TSC-1367 MNTR. AGNCY.- DOT-TSC-FRA 80-25, FRA/ORD 80/80 NTIS Prices- PC A05/MF A01

This report contains a summary of the results of the test program that was conducted to validate the TGMS under various static and dynamic conditions. The TGMS has the capability to measure or derive gage, crosslevel (superrelevation), warp (twist), curvature, maximum operating speeds for curves, vehicle speed and elapsed distance at speeds from near 0 to 30 mph. The TGMS is equipped with an automatic location detection system to accurately reference detected track geometry exceptions to permanent fixtures of the track roadbed. The track geometry measurements are compared to the Federal Railroad Administration Track Safety Standards and all detected exceptions are reported in real time by onboard digital computer.

MEASUREMENT AND DIAGNOSIS OF THE NOISE FROM A GENERAL ELECTRIC C36-7 DIESEL ELECTRIC LOCOMOTIVE. PB81-112914/XPS

Remington, P. J. Alakel, M. N. Dixon, N. R.

CORP. SOURCE- Bolt Beranek and Newman, Inc., Cambridge, MA. JOURNAL VOL.- u8104 DESCRIP. NOTE- Final rept. Sep 78-Aug 79 REPORT DATE- Dec 79 PAGINATION- 105p REPORT NO.- BBN-4167 CONT. NO.- DOT-TSC-1580 MNTR. AGNCY.- DOT-TSC-FRA 79-26, FRA/ORD 79/52 NTIS Prices- PC A06/MF A01

Measurements of the noise from a General Electric C36-7 diesel electric locomotive were performed with the locomotive stationary and attached to a load cell during powered and unpowered pass-by tests. The pass-by tests demonstrated that wheel/rail noise contributes little to both interior and wayside noise when the locomotive is

operating under load at throttle 8. Stationary tests examined the directivity of noise around the locomotive and the contribution of the major sources to the noise signature. At throttle 8, under load and at idle, the exhaust and radiator cooling fan were the primary sources. At throttle 8, unloaded, the radiator cooling fan exhaust and equipment blower dominated the noise.

AMTRAK/KNORR DISC BRAKE STUDY. VOLUME II. APPENDICES A THROUGH I. PB81-109845/XPS

Scofield, R. Avant, R.

CORP. SOURCE- ENSCO, Inc., Alexandria, VA. Rail Transportation Engineering Div. JOURNAL VOL.- u8104
DESCRIP. NOTE- Final rept. Feb-Jul 79 REPORT DATE- Sep 80
PAGINATION- 236p REPORT NO.- ENSCO-DOT-FR-80-12-2
CONT. NO.- DOT-FR-64113 MNTR. AGNCY.- FRA/ORD 80/62.2
NTIS Prices- PC A11/MF A01

This volume contains the following appendices to Volume I, Final Report: Appendix A - Wheel Condition Effects; Appendix B - Effects of Cyclic Loads on Pin Wear; Appendix C - Over-the-Road Test Acceleration Data from the Boston Run; Appendix D - Over-the-Road Test Acceleration Data from the Montreal Run; Appendix E - Laboratory Test - Lateral Dynamic Load Test (Pendulum/Bong Test); Appendix F - Vertical Impulse Loading - Laboratory Test; Appendix G - Static Load Test; Appendix H - Temperature, Precipitation, and Snow-on-the-Ground Plots; and Appendix I - Test Plan.

AMTRAK/KNORR DISC BRAKE STUDY. VOLUME I. FINAL REPORT.
PB81-109837/XPS

Scofield, R. Avant, R.

CORP. SOURCE- ENSCO, Inc., Alexandria, VA. Rail Transportation Engineering Div. JOURNAL VOL.- u8104
DESCRIP. NOTE- Rept. for Feb-Jul 79 REPORT DATE- Sep 80
PAGINATION- 208p REPORT NO.- ENSCO-DOT-FR-80-12-1
CONT. NO.- DOT-FR-64113 MNTR. AGNCY.- FRA/ORD 80/62.1
NTIS Prices- PC A10/MF A01

This report describes the Amtrak/Knorr Disc Brake Study which was developed: to evaluate candidate replacement disc brakes for the Knorr disc brakes presently in use on Amfleet and Turboliner cars; to explain the cause of the loosening of the attaching pins and the excessive wear experienced by the disc-brake friction ring on the Knorr disc brakes; and to find out why the disc brake failure rate was much higher when the outside temperature was below 32 degrees Fahrenheit. This report covers the first six months of a three-year controlled revenue service test, an over-the-road test, and laboratory tests to correlate over-the-road test results to pin wear.

DEVELOPMENT OF A PROTOTYPE EMAT (ELECTROMAGNETIC ACOUSTIC TRANSDUCERS) SYSTEM FOR INSPECTION OF RAILS.
PB81-109514/XPS

Alers, G. McLauchlan, D. Maiseri, H. Lee, R.

CORP. SOURCE- Rockwell International, Albuquerque, NM. Albuquerque Development Lab. JOURNAL VOL.- u8104
DESCRIP. NOTE- Final rept. Oct 79-Mar 80 REPORT DATE- Sep 80 PAGINATION- 79p CONT. NO.- DOT-FR-9143 MNTR. AGNCY.- FRA/ORD 80/45 NTIS Prices- PC A05/MF A01

This is the final report of the first phase of an investigation of the application of Electromagnetic Acoustic Transducers (EMAT's) to detect flaws in railroad rails. EMAT's generate ultrasonic beams in rails and receive return signals without surface contact and without liquid couplant. This work used samples of flawed rails and laboratory EMAT equipment to verify the EMAT technology can detect critical rail flaws. Sperry Rail Service assisted in defining

operating requirements for an operational inspection system. A preliminary determination of EMAT operating parameters for optimum flaw detection was made. This work demonstrated that virtually all of the critical rail flaws can be detected in the laboratory by EMAT's with a sensitivity comparable to that obtained with conventional piezoelectric transducers.

METROLINER TRUCK IMPROVEMENT PROGRAM. PB81-113714/XPS

Seely, R. M.

CORP. SOURCE- General Steel Industries, Inc., St. Louis, MO. GSI Engineering Div. JOURNAL VOL.- u8103 DESCRIP. NOTE- Final rept. Jun 76-Jul 77 REPORT DATE- Sep 80 PAGINATION- 66p CONT. NO.- DOT-FR-64237 MNTR. AGNCY.- FRA/ORD 80/74 NTIS Prices- PC A04/MF A01

The report summarizes the results of design and ride testing procedures followed in developing a Metroliner Truck Improvement Program. The Metroliner cars had been used in high speed Corridor service for nearly ten years and upgrading the truck suspension to modern standards for improved passenger ride was considered to be very desirable. Preliminary design projections indicated this could be accomplished at comparatively modest cost and with potential savings in maintenance costs by modifications only to the primary and secondary spring systems.

TRUCK DESIGN OPTIMIZATION PROJECT (TDOP) PHASE II. PB81-104945/XPS

Sheldon, G. Bakken, G. Cappel, K. Gibson, D. Gilchrist, A.

CORP. SOURCE- Wyle Labs., Colorado Springs, CO. Scientific Services and Systems Group. JOURNAL VOL.- u8103 DESCRIP. NOTE- Interim rept. Nov 77-May 80 REPORT DATE- Jun 80 PAGINATION- 105p REPORT NO.- TDOPTR-12 CONT. NO.- DOT-FR-742-4277 MNTR. AGNCY.- FRA/ORD 80/59 NTIS Prices- PC A06/MF A01

The overall objective of the TDOP Phase II project is to characterize the behavior of existing trucks (defined as

Type I trucks) and to generate performance and test specifications for new truck designs (referred to as Type II trucks). The purpose of this document is to report on the progress to date of TDOP Phase II. The report summarizes the methodology employed to develop performance and test specifications and the rationale used for selecting seven Type II trucks for field testing. The Interim Report also discusses preliminary conclusions reached in several economic areas, including car and truck maintenance costs, fuel consumption, and rail wear in curves. Further, the report describes on-going field test programs (the truck performance testing and wear measurement programs) and the completed Friction Snubber Force Measurement System test program. In the analysis area, an assessment and validation of 17 computer simulation models of freight cars is discussed in detail. The Interim Report concludes with a description of the work-in-progress for a Type I truck performance characterization.

INTERMODAL FREIGHT PROGRAM-PHASE II DEMONSTRATION MANAGEMENT. PB81-106510/XPS

Yardley, C. F.

CORP. SOURCE- Association of American Railroads, Washington, DC. JOURNAL VOL.- u8102 DESCRIP. NOTE- Final rept. Feb 77-Jul 80 REPORT DATE- Jul 80 PAGINATION- 131p CONT. NO.- DOT-FR-708-5169 MNTR. AGNCY.- FRA/ORD 80/69 NTIS Prices- PC A07/MF A01

The Intermodal Freight Program was established to develop and demonstrate profitable improved rail intermodal service (the movement of highway trailers and/or containers on rail flatcars). Emphasis was placed on developing the use of multiple frequency dedicated trains in intermediate distance markets (200-600 miles) dominated by trucks. Railroads operating demonstrations approved under the program were eligible for federal assistance covering 40 to 60 percent of operating losses during periods required to attain profitability. From June, 1978, through May, 1980, the Milwaukee Road operated a demonstration between Chicago and the Twin Cities (Minneapolis/St. Paul). The demonstration involved four dedicated intermodal trains each way each weekday in the corridor. Labor cooperation produced improved productivity in the service and improved capital utilization was attained through rapid equipment turns. A highly reliable service was developed. Milwaukee intermodal traffic

in the corridor doubled from predemonstration levels with the additional business being attracted primarily from the highway. Profitability was attained during peak volume periods and possibilities for profit enhancement were identified. The experience gained during the demonstration should be of value to carriers considering similar services.

LABORATORY INVESTIGATION OF LATERAL TRACK SHIFT.
PB80-223928/XPS

Choros, J. Zarembski, A. M. Gitlin, I.

CORP. SOURCE- Association of American Railroads, Chicago, IL. Research and Test Dept. JOURNAL VOL.- u8025
DESCRIP. NOTE- Interim rept. REPORT DATE- Aug 80
PAGINATION- 83p CONT. NO.- DOT-FR-30038 MNTR. AGNCY.-
FRA/ORD 80/27 NTIS Prices- PC A05/MF A01

This report describes test procedures and results of the AAR lateral track shift tests. The tests included static and dynamic lateral track loadings under various vertical loads, relative effects of single and double axle loading, panel shift tests and single tie tests. These tests, which were conducted at the AAR's Track Laboratory, were designed to quantify and determine the lateral strength of the track using various methods. The test results are limited to an unconsolidated track condition. The results indicate that a lateral stiffness of the track can be determined from each of the three methods used. These results, obtained from each of the methods tested, are compared in this report.

LABORATORY INVESTIGATION OF TRACK GAUGE WIDENING CHARACTERISTICS. PB80-222003/XPS

Choros, J. Zarembski, A. M. Gitlin, I.

CORP. SOURCE- Association of American Railroads, Chicago, IL. Research and Test Dept. JOURNAL VOL.- u8025
DESCRIP. NOTE- Interim rept. REPORT DATE- Aug 80
PAGINATION- 80p CONT. NO.- DOT-FR-30038 MNTR. AGNCY.-
FRA/ORD 80/33 NTIS Prices- PC A05/MF A01

This report describes test procedures and results of the ARR rack guage widening tests. The test included static and dynamic lateral rail loadings under various vertical and longitudinal loads, relative effects of single and double axle guage widening and single axle dynamic guage widening under a range of applied vertical loads. These tests were conducted to study the effects of progressive track damage, due to guage widening, to determine if non-destructive guage widening field tests are feasibile and if so, the best vertical and lateral loads to be used for testing purposes. This results of these tests indicate that non-destructive gauge widening testing is possible, and that the predamaged condition of the track can be measured and evaluated.

TRACK COMPONENT PROPERTY TESTS. VOLUME II - RAIL TIES JOINT-BARS AND FASTENERS. PB80-218977/XPS

Choros, J. Gitlin, I.

CORP. SOURCE- Association of American Railroads, Chicago, IL. Research and Test Dept. JOURNAL VOL.- u8025
DESCRIP. NOTE- Interim rept. REPORT DATE- Jun 80
PAGINATION- 55p CONT. NO.- DOT-FR-30038 MNTR. AGNCY.-
FRA/ORD 80/25 NTIS Prices- PC A04/MF A01

This report describes the test procedures and the results of the tests on the physical properties of rail, concrete ties, jointbars and fasteners. The properties obtained are the torsional rigidity of rail, bending rigidity of concrete ties, bending stiffness of jointbars and fasterner resistance to rotation about the vertical, lateral and longitudinal axis. The components tests were run on two rail sections, 115 RE and 136 RE, on five different concrete ties, on 136 RE rail joint bars, and on five fasteners configurations on the two different rails on wood ties and two configurations on the 115 RE rail on concrete ties.

PERSONNEL SAFETY ON ELECTRIFIED RAILROADS.
PB80-220858/XPS

Abbas, J. D. Phillips, W. E. Jr.

CORP. SOURCE- Transportation Systems Center, Cambridge, MA.
JOURNAL VOL.- u8024 DESCRIP. NOTE- Final rept. Apr 76-Jun 79 REPORT DATE- Jun 80 PAGINATION- 60p REPORT NO.- DOT-TSC-FRA-80-14 CONT. NO.- DOT-TSC-1180 MNTR. AGNCY.- FRA/ORD 80/36 NTIS Prices- PC A04/MF A01

Potential electrical hazards to fire, police, and rescue personnel responding to emergencies on electrified railways are examined. Data on descriptions of electrical facilities, types of accidents and danger to emergency personnel, and reviews of operating procedures have been obtained during a series of visits to electrified rail and transit systems. Programs to reduce electrical hazards to emergency personnel are proposed. These programs are evaluated by a cost-benefit comparison, and recommendations are selectively made. Joint development of emergency operating plans by rescue and railroad organizations, and installation of direct telephone lines to the power director are recommended as being most cost-effective.

ANALYTICAL METHODS FOR FREIGHT CAR/TRUCK DYNAMIC PROBLEMS.
PB80-219389/XPS

CORP. SOURCE- Martin Marietta Corp., Denver, CO. Denver Div.
JOURNAL VOL.- u8024 DESCRIP. NOTE- Technical rept. Mar 74-Aug 80. REPORT DATE- Jul 80 PAGINATION- 57p REPORT NO.- MCR-80-531 CONT. NO.- NAS8-29882 MNTR. AGNCY.- FRA/ORD 80/29 NTIS Prices- PC A04/MF A01

The analytical methods used to synthesize mathematical models of an 80-ton open hopper railroad car are presented in this report. This effort was directed toward accurately characterizing the dynamic behavior of this specific railcar configuration. In a larger sense, model formulation and solution using the methods detailed here serve as a potential approach to the characterization of other railcar configurations. The report details the formulation of a nonlinear model including the carbody, trucks, and wheel/rail interactions. In particular hunting stability of the railcar was investigated, and analytical results were

compared to actual test data. Test/analytical correlation was very good.

TRACK REHABILITATION RESEARCH AND DEVELOPMENT: A BASIS FOR PROGRAM PLANNING. PB80-210495/XPS

Martin, R. E. Anderes, J. R. Zobrak, M. Wuerdemann, H.

CORP. SOURCE- MITRE Corp., McLean, VA. JOURNAL VOL.- u8024 DESCRIP. NOTE- Final rept. REPORT DATE- Mar 80 PAGINATION- 318p CONT. NO.- DOT-FR-54090 MNTR. AGNCY.- FRA/ORD 80/10 NTIS Prices- PC A14/MF A01

The Federal Railroad Administration has established a Track Rehabilitation Research and Development program to better meet its obligations under the Railroad Revitalization and Regulatory Reform Act of 1976. In support of that effort, this report identifies and rank-orders track system problems, suggests a number of subprograms aimed at solving the more important problems, and evaluates and rank-orders the subprograms. This report contains detail of the subprograms as identified in part in a previously published summary report 'Track Rehabilitation and Maintenance Research Requirements', (PB80-161169). These recommended candidate subprograms will be considered by the Federal Railroad Administration, Office of Research and Development as part of the process of establishing track research projects. The selected projects may support a variety of research requirements, in addition to those detailed herein, and therefore may not be implemented precisely as described. Also, the sequence of progression of the projects may not exactly match the recommended rankings due to other considerations which could not be reflected in this report.

TRACK AND BRIDGE MAINTENANCE RESEARCH REQUIREMENTS.
PB80-207855/XPS

Wengenroth, R. H. Clapp, H. P.

CORP. SOURCE- Parsons, Brinckerhoff, Quade and Douglas, Inc., New York. JOURNAL VOL.- u8023 DESCRIP. NOTE- Final rept. REPORT DATE- Mar 80 PAGINATION- 140p CONT. NO.- DOT-FR-80071 MNTR. AGNCY.- FRA/ORD 80/11 NTIS Prices- PC A07/MF A01

This report includes the design of seven research plans in the area of track and bridge maintenance. The railroad industry was surveyed to ascertain the maintenance problems of their greatest concern which lend themselves to resolution by research. The problems uncovered in the survey were ranked based upon the opinion of the industry and the following seven of the top ranked problem categories were selected for the development of research plans: bridge inspection, rating and evaluation of remaining life; subgrade stabilization and improvement; timber cross tie rehabilitation and disposal; special trackwork maintenance; bolted joints; ballast fouling from external sources; and switch point wear limits.

RAILROAD R AND D CHALLENGES OF THE 80'S: OPPORTUNITIES AND OBSTACLES. RAILROAD ENGINEERING CONFERENCE PROCEEDINGS (15TH) HELD AT TRANSPORTATION SYSTEMS CENTER CAMBRIDGE MA. ON OCTOBER 21-23 1979. PB80-205206/XPS

CORP. SOURCE- Transportation Systems Center, Cambridge, MA. JOURNAL VOL.- u8023 REPORT DATE- Jun 80 PAGINATION- 125p REPORT NO.- DOT-TSC-FRA-80-10 MNTR. AGNCY.- FRA/ORD 80/35 NTIS Prices- PC A06/MF A01

Conference papers were delivered by various industry and Government officials and centered on three topic areas: The Status of the Northeast Corridor Improvement Project and Passenger R&D; An Overview of Freight Technology Advancements, Obstacles, and Future Opportunities; and Major R&D Opportunities of the 80's. A tour of the Sante Fe-San-Vel concrete crosstie plant in Littleton, Massachusetts, was included as part of the conference program.

MEASUREMENTS OF WHEEL/RAIL LOADS ON CLASS 5 TRACK.
PB80-196868/XPS

Ahlbeck, D. R. Johnson, M. R. Harrison, H. D.
Tuten, J. M.

CORP. SOURCE- Battelle Columbus Labs., OH. JOURNAL VOL.- u8021 DESCRIP. NOTE- Final rept. Jan-Dec 78 REPORT DATE- Feb 80 PAGINATION- 294p CONT. NO.- DOT-TSC-1051 MNTR. AGNCY.- FRA/ORD 80/19, DOT-TSC-FRA 80-6 NTIS Prices- PC A13/MF A01

Measurements have been made on two tangent test sections and a curved test section to characterize the wheel/rail load environment on Class 5 track. The tangent-track test sections included a 3-mile length of bolted-joint rail and a 3-mile length of continuous welded rail. Wayside measurements of loads under passing revenue traffic were obtained from randomly located strain gage patterns on the rail, while an instrumented 100-ton freight car was run over the test sections at a range of speeds to define the load spectrum from the vehicle. Joint impact loads were defined from the instrumented wheelset measurements, while special wayside measurements were included to define the influence of wheel flats. Additional measurements were obtained from the on-board instrumentation over a test section that included two 6-degree, 6-inch super elevation curves. This report presents the data obtained from these measurements and describes the wayside and vehicle-borne instrumentation, the experiment design and operation, and the data reduction and analysis approach employed. Statistical summaries of the load environments are presented.

USE OF AUTOMATICALLY ACQUIRED TRACK GEOMETRY DATA FOR MAINTENANCE-OF-WAY PLANNING. PB80-198609/XPS

Hayes, G. Bradley, K. Price, B. Sawyer, D. Dominguez, A.

CORP. SOURCE- ENSCO, Inc., Alexandria, VA. Engineering Test and Analysis Div. JOURNAL VOL.- u8022 DESCRIP. NOTE- Final rept. REPORT DATE- Jun 80 PAGINATION- 125p
REPORT NO.- ENSCODOTFR-79-20 CONT. NO.- DOT-FR-64113
MNTR. AGNCY.- DOT/FR 80/44 NTIS Prices- PC A06/MF A01

This report covers a joint FRA/Rail Industry Program to develop maintenance planning techniques based on regularly-scheduled automated track-geometry-measurements and maintenance-of-way reports. The study was conducted from 1971 through 1978 with the cooperation of the Bessemer and Lake Erie, and the Denver and Rio Grande Western Railroads. As a result of the program, maintenance-of-way reports generated from track-geometry-measurement data have been used by the participating railroads in their maintenance planning and in the improvement of their overall track safety.

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